How WESTINGHOUSE saves $37,000 yearly at its Trafford, Pa. Foundry

■ This plant formerly loaded and unloaded bagged material, handled barrels and stored patterns by manual methods. Today fork trucks have mechanized all these operations. Result: *an annual saving of $37,000.*

In the warehouse, for example, the fork trucks now stack materials on pallets—right up to the rafters. Indirect benefits: space saving, fewer accidents, less material damage. Direct benefits: substantial savings in labor costs.

Fork-truck handling and tiering of patterns eliminated back-breaking work, increased storage capacity 500% and made additional labor savings.

Unloading bagged material (wood flour, sea coal, mogal, pich, etc.) and fire brick (formerly manhandled one at a time) is now done in palletized unit loads—another big cost saver. And still more money is saved by handling barrels with a Baker 4-Purpose Carriage truck and drum shoes.

write for *6-page special report on the application of Baker attachments to various loads.*

Baker
industrial trucks

THE BAKER-RAULANG COMPANY
1251 WEST 80th STREET • CLEVELAND 2, OHIO

BAKER-LULL Corporation, *Subsidiary*, Minneapolis, Minn.
Material Handling and Construction Equipment.

For more facts circle 502 on Reply Card

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'ROUND ABOUT with the editors in field and office

Edited by R. L. Marinello

Plant Maintenance and Engineering Show

PLANT ENGINEERING recently received a letter from Plant Engineer Overton, of Seabrook Farms Co., inquiring about the Plant Maintenance Conference for next year.

"Our representatives who attended the Plant Engineering Conference at Cleveland last January have reported favorably on the activities and exhibits at that Conference. We would be interested in knowing what plans have been made for the next Conference.

"If you can furnish this information, it will be greatly appreciated." *W. J. Overton, Plant Engineer, Seabrook Farms Co., Bridgeton, New Jersey.*

In answer to Mr. Overton's inquiry, Chicago will be host to the many plant engineers who will visit the Fifth Plant Maintenance and Engineering Show. The exposition will take place at the International Amphitheatre from January 25 through 28, 1954.

Concurrently with the show, the Plant Maintenance and Engineering Conference will be held at the Hotel Conrad Hilton. As soon as PLANT ENGINEERING receives additional information on the papers that will be presented at the Conference, the readers will be notified through this department.

Advance registration cards will be available the latter part of this year. Reservations for these cards may be made by writing to Clapp and Poliak, Inc., 341 Madison Avenue, New York 17, N. Y., or by marking "registration card" on a postage-paid card in this issue.

Road Show on Lift Trucks

DISTRIBUTORS AND USERS of lift truck equipment will soon be seeing the "Buda Magic" show which is touring all the principal cities in the country. The road show performances will concentrate on demonstrations of lift trucks.

Major share of the program is devoted to Buda's FT models, with emphasis on such features as stripdown in 22 seconds, complete disassembly in 22 minutes and an actual clutch change in 30 minutes.

Readers interested in knowing when the road show will be in their area, may write to The Buda Co., Harvey, Illinois.

Noise Abatement Symposium

FOURTH ANNUAL National Noise Abatement Symposium will be held on October 23 and 24 at the Armour Research Foundation of Illinois Institute of Technology, Chicago, Illinois.

This year's symposium is designed to give a comprehensive picture of nationwide activities in the field of noise and will feature talks by leading authorities on outdoor noise problems.

Afternoon session on Friday will discuss the industrial noise hazard situation and cover talks on the following subjects: The Relation of Hearing Losses to the Noise Exposure in Industry, Recent Noise Hazard Legislation and Its Implications, and Combatting The Effects of Noise.

Further information about this Symposium may be obtained by writing to Jim Mitchel, Illinois Institute of Technology, Technology Center, 35 West 33rd St., Chicago 16, Illinois.

Personnel Changes at Monsanto

O. R. Bailey, who has been maintenance superintendent at Monsanto Chemical Company's plant at Monsanto, Tennessee, was recently promoted to chief construction engineer and will assume his new duties at the company's Phosphate Division in Anniston, Alabama.

Ralph Neubert, who since 1950 has been maintenance superintendent at Monsanto's Anniston plant, has been named to succeed Bailey at the Tennessee plant.

National Metal Show

CLEVELAND PUBLIC AUDITORIUM, Cleveland, Ohio, will be the meeting place for the 35th National Metal Congress and Exposition, to be held from October 19 through 23.

In addition to companies exhibiting equipment dealing with either the production, treatment, or fabrication of metals into component parts or products, there will be technical programs conducted by American Society of Metals, American Welding Society, Institute of Metals Division, American Institute of Mining and Metallurgical Engineers, and Society for Non-Destructive Testing.

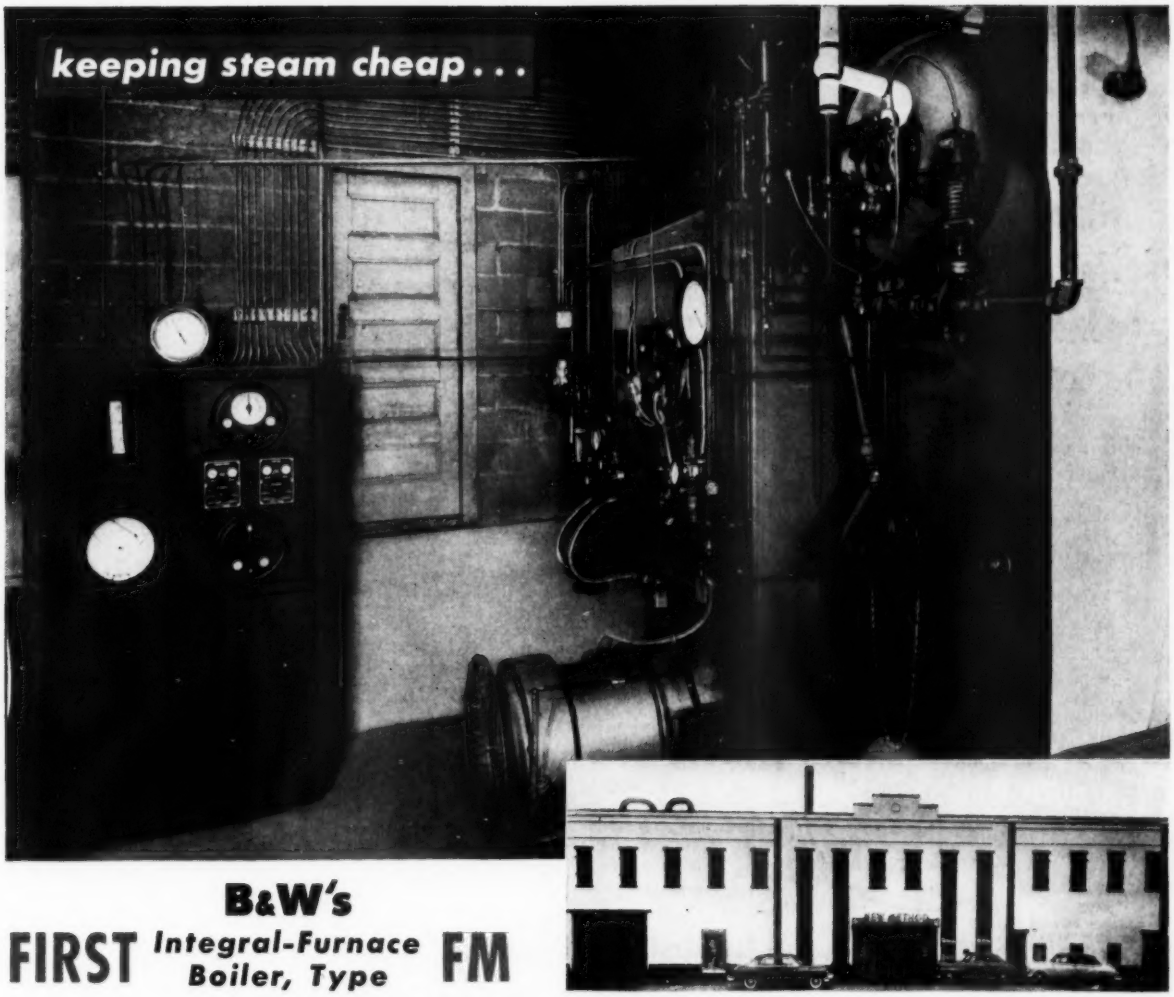
"Metals Market Place of the World" is the theme of this year's program. More information on the program is available from Walter Morrison, 7301 Euclid Avenue, Cleveland 3, Ohio.

Plant Construction News

CONSTRUCTION is underway at Cleveland, Ohio, on a new laboratory building for the **Forbes Finishes Division** of Pittsburgh Plate Glass Co. . . . **Fairchild Aircraft** has now moved its C-119 production into new manufacturing facilities and is putting the finishing touches on buildings erected under its recent plant expansion program . . . Industrial expansion program is underway at the Matoon, Illinois, plant of **Young Radiator Co.** . . . Construction has started at Cambridge, Ohio, on a new structure to augment the output of **Champion Spark Plug Company's** Detroit ceramic plant . . . Plant expansion at the Tuscaloosa, Alabama, tire and tube manufacturing plant of **The**

(Continued on page 6)

Plant Engineering is published monthly at Chicago, Ill. Subscriptions one year $10 in the U. S. A. Canada $11; Elsewhere $12. Acceptance under Section 34.64, P. L. & R. authorized by Post Office.



B&W's FIRST *Integral-Furnace Boiler, Type* FM

SAVING 20% ON FUEL ALONE

at New Method Service

After three years of operation at the modern plant of New Method Service—a leading Staten Island laundry and dry cleaning company—the first B&W shop-assembled, Integral-Furnace Boiler, Type FM, to go into service, has proved its economy and efficiency to the complete satisfaction of the company's management and operating personnel.

This self-contained B&W oil-fired unit was installed in May, 1950, as part of a modernization program for the big New Method plant, which has been serving Staten Island residents for 31 years. With a steam capacity of 20,000 lb per hr at a pressure of 135 psi, the FM Boiler supplies steam for both heat and processing requirements of the more than 5000 garments for dry cleaning and 4000 laundry bundles handled during the average week. The B&W unit, with automatic control, supplies steam at a constant pressure, raising considerably the overall plant operating efficiency. Cleanliness—essential in a laundry—is no longer a problem, due to the elimination of smoke and ash handling. Space-saving, in and around the plant, is another plus-factor. Outside areas formerly occupied by coal and ash piles have been put to more practical use, and boiler-room space made available by the new unit provides a maintenance shop for the entire plant. Boiler-room men report only minor maintenance since the B&W unit was put into service. Summing it up, Mr. Louis Lawch, President of New Method recently remarked, "We're very happy with our investment, the boiler runs like a charm."

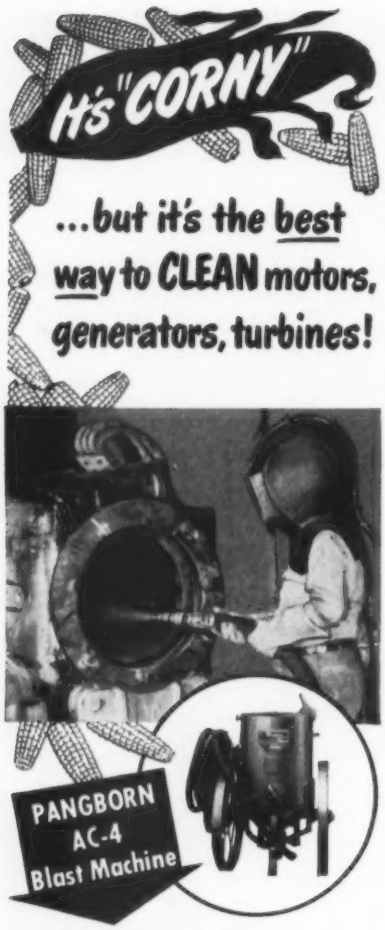
Since the debut of B&W's Integral-Furnace Boiler, Type FM, at New Method, additional units of this type, placed in service or on order, have a total steam capacity exceeding 6½ million lb per hr. This versatile B&W boiler is available in steam capacities ranging from 2900 to 28,000 lb per hr at pressures between 15 and 235 psi, suitable for a wide variety of industrial, utility, and other applications.

Write for Bulletin G-76, for an illustrated, detailed description of the many other cost-saving features of this unique unit, The Babcock & Wilcox Company, Boiler Division, 161 E. 42nd St., New York 17, N. Y.

G-603

BABCOCK & WILCOX
BOILER DIVISION

For more facts circle 503 on Reply Card



- CUTS DOWN-TIME
- CLEANS WITHOUT SOLVENTS
- ELIMINATES DRYING
- ELIMINATES TOXIC AND EXPLOSIVE DANGERS

THE new Pangborn AC-4 Blast Machine cleans motors, generators and turbines faster . . . cleaner . . . and lets you use them sooner because there's no waiting for parts to dry. In fact, dangerous solvents that can lead to explosions, caustic action, and toxic poisoning are completely eliminated!

The AC-4 uses soft, 20-mesh corncob grits to rapidly remove dirt, grease, old paint, etc., in one-third the time, and at 90% less cost than old-fashioned methods. GET FULL DETAILS . . . write, telling us what you clean, to: PANGBORN CORP., 3200 Pangborn Boulevard, Hagerstown, Md.

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment

Pangborn

BLAST CLEANS CHEAPER with the right equipment for every job

For more facts circle 504 on Reply Card

'ROUND ABOUT

B. F. Goodrich Co. is expected to be completed in late 1954 . . . **Wood Preserving Division** of Koppers Co., Inc. will start erection of a wood preserving plant at Horseheads, New York . . . **Westinghouse Electric Corp.** is building a plant in Duluth, Minnesota, to repair or rebuild any heavy electrical product, including mining, industrial and farming electrical apparatus . . . **Glidden Co.** is expanding its Chicago plant to increase manufacturing and warehousing space . . . **Brunner Manufacturing Co.** is constructing a new plant at Gainesville, Georgia.

Have You Seen This One?

WE ARE REMINDED by a recent request for information on cost control in the maintenance department that a most handy reference on this subject—and many others, of course, close to the heart of the plant engineer—are the papers presented at the annual Plant Maintenance Show. Each year's proceedings are published in a bound volume at $6.00 apiece. Publisher is Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N.Y.

Purdue Packaging Course

TO MEET THE need for technical training in the field of packaging, Purdue University is inaugurating the Packaging Institute. The four weeks course will be offered periodically throughout the year—the first three being scheduled to start September 28, October 26, and January 4. The Institute will provide related technical information for persons employed in packaging in industry, transportation, and the military services.

Areas of study to be covered by the course include the packaging engineer and his tools, the chemistry of corrosion, applied mechanics in relation to packaging, vibration problems in transportation, strength of materials, container design, and atmospheric, pest and radiation hazards.

Also included will be the characteristics of packaging and container materials, transportation agency requirements in shipping, analysis of prize winning packaging, cost considerations, economics, business psychology, legal aspects, and patent infringements.

Additional information about this course may be obtained by writing to Mart I. Fowler, Chairman, Division of Adult Education, Engineering Administration Bldg., Purdue University, Lafayette, Indiana.

Industrial Packaging and Materials Handling Exposition

EIGHTH ANNUAL National Industrial Packaging and Materials Handling Exposition will be held at Mechanics Building, Boston, on October 20, 21 and 22.

Products, materials, services and equipment in the industrial packaging and materials handling fields will be on display. In addition, a short course will be held concurrently in the Mechanics Building, concentrating on the problems, developments and the future of the packaging and materials handling industry.

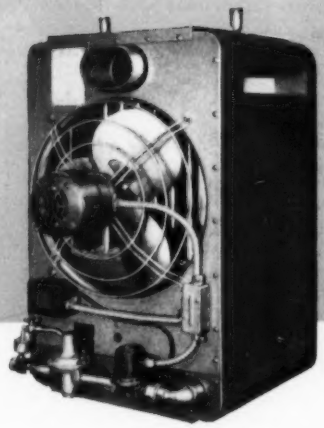
Plant Engineering Receives Safety Award for Fourth Time

Left to right: Robert D. Gidel, Senior Engineer, National Safety Council's Industrial Division, congratulates Richard H. Morris, Editorial Director (holding plaque) and Thomas E. Hanson, Editor. This was the fourth time Plant Engineering has received public interest Award for "exceptional service to safety"

GRINNELL announces its new line of

GAS-FIRED UNIT HEATERS

Available in 7 sizes — with input ratings from 25,000 to 200,000 Btu's.



All parts readily accessible for periodic servicing.

AUTOMATIC! EFFICIENT! ASSURE YEARS OF DEPENDABLE SERVICE

Grinnell gas-fired unit heaters are easy to install, simple to operate and maintain. Efficient performance assured — with any type of gas — by modern design of burners and heat exchanger, proper motor and fan unit.

Automatic safety pilot operates to shut off main gas supply if pilot burner goes out. Flashback and extinction noise prevented by the burners' raised port design and proper port size for the gas used. Low speed motors have built-in thermal overload protection and automatic reset.

Additional features of Grinnell *gas-fired* unit heaters . . .

- Casing die-formed of heavy steel, with baked-on enamel finish
- Heat exchanger tubes and draft diverter of aluminized steel
- Combustion chamber of heavy steel, welded
- Burners of close-grained iron castings
- Adjustable louvers
- Burners and control assembly removable as a unit
- Hinged bottom pan permits cleaning interior of tubes
- Threaded pipe hangers for easy suspension
- Only wiring required is connection to room thermostat or manual switch
- Approved by the American Gas Association

WRITE FOR CATALOG

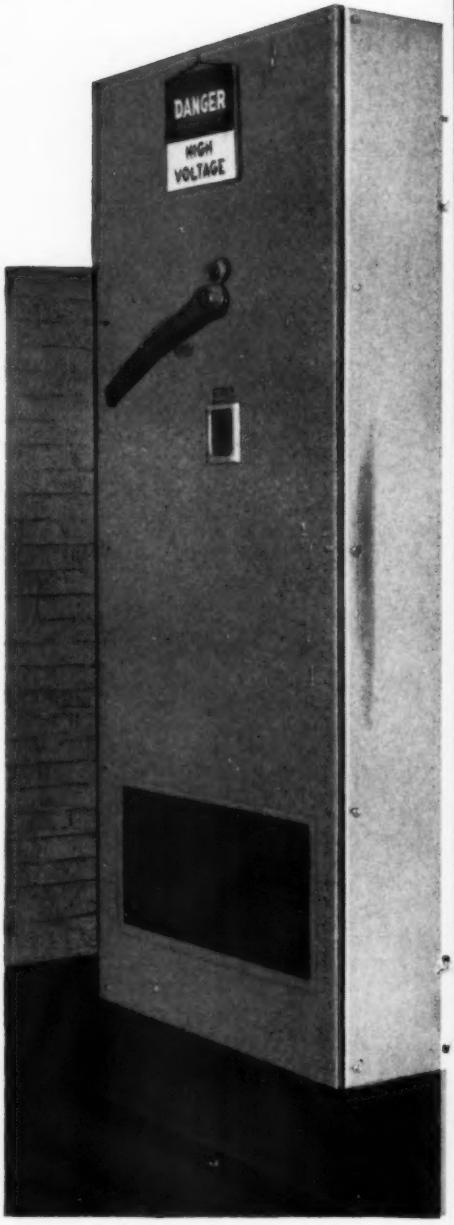
GRINNELL
UNIT HEATERS FOR STEAM, HOT WATER, GAS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports
Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

For more facts circle 505 on Reply Card

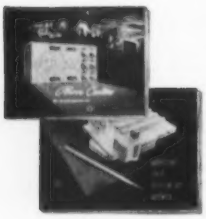
The best way to keep Power Distribution in step with Plant Expansion!



Rock Hill Printing and Finishing Company had a power problem that plagues many industries today. Their rapidly expanding plant was simply growing away from its power source. The resulting overextension and overloading of feeders created conditions that always hamper production: excessive line losses . . . poor voltage conditions . . . frequent service interruptions. But note how effectively a Westinghouse Power Center—serving as an additional distribution point—solved the problem . . .

> "After the installation, we found voltage conditions improved as much as 10 percent . . . line losses reduced 5 percent . . . and unnecessary tripping out completely eliminated.
>
> "Remarkably little time and engineering effort were required in making the installation. We found it almost as simple as plugging in an appliance. And we saved nearly 2000 feet of cable as a result of shorter, low-voltage runs."

This Westinghouse Dry-Type Power Center will enable this user to realize even further savings. The elimination of vaults, oil conditioning and testing, promises a saving in maintenance, virtually eliminates fire hazard, and provides greater safety for operating personnel. Westinghouse Power Centers offer these same advantages to you. J-60777



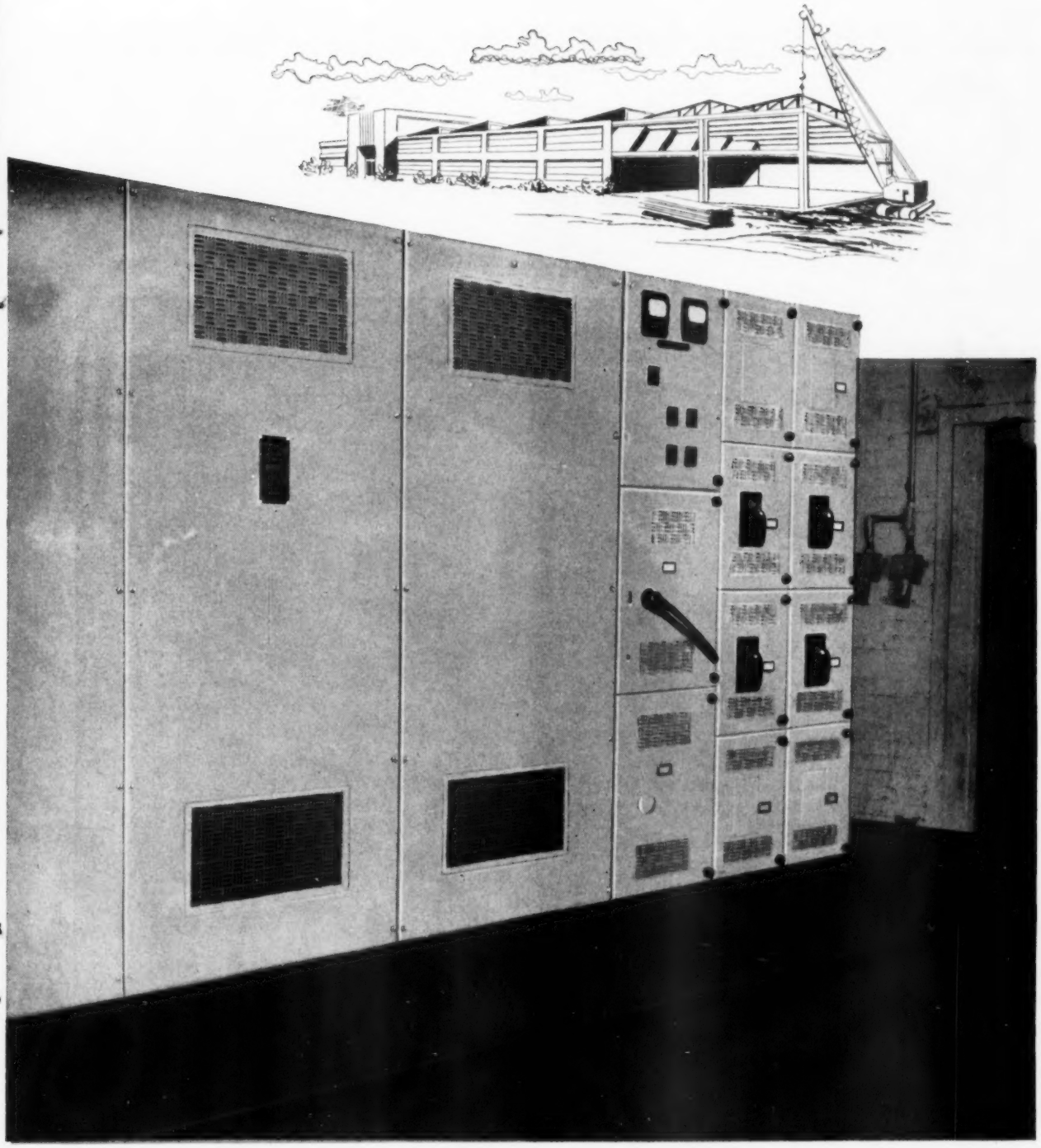
GET THE COMPLETE STORY

Westinghouse Power Centers are the key to efficient power distribution. They offer better service continuity, greater flexibility, better regulation—all the things that contribute to power distribution economy. Most important, they provide the simplest, lowest cost way of attaining the power system that best meets your operating requirements.

Booklet B-4162 covers Westinghouse Power Centers in detail. Booklet B-4045 discusses various types of plant distribution systems wherein Power Centers offer maximum advantage. For your copies contact your Westinghouse Representative or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

YOU CAN BE SURE... IF IT'S Westinghouse

POWER CENTERS



AT ROCK HILL PRINTING AND FINISHING COMPANY

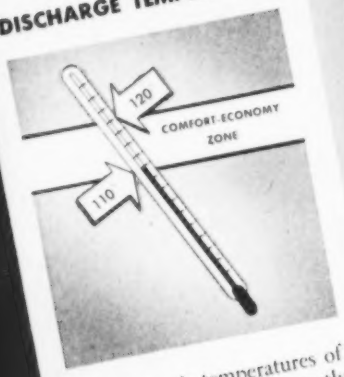
Rock Hill, S.C... this Westinghouse Dry-Type Power Center is part of a distribution system as modern as the plant additions it serves. Located near the center of load it makes possible shorter secondaries, lower line losses, better regulation.

Before you buy any unit heater

Compare

MODINE STEAM and HOT WATER units that top the field

Compare
DISCHARGE TEMPERATURES



Discharge air temperatures of 110° to 120° F. are correctly related to air velocities — the key to perfect heating comfort plus lower fuel costs.

Compare
HEAT THROW

No one but Modine gives you a built-in velocity generator that effectively steps up heat throw, assures positive heat penetration of cold air strata near floor.

In addition to horizontal delivery models, Modine offers a new line of vertical units for both steam and hot water. New, improved design is lighter, smaller, yet gives you *greater* capacity.

Compare LONG LIFE

Modine's advanced engineering is combined with superb styling and highest grade materials. Your assurance of long years of trouble-free service. *But see for yourself!* Call the Modine representative listed in your phone book, or write for Bulletin 153 on Modine Steam and Hot Water Unit Heaters.

Modine

...steam, hot water or gas...

Modine WITH ALL OTHERS!

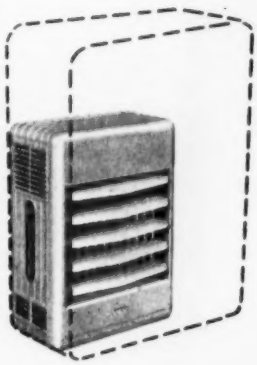
Modine Gas-Fired Unit Heaters are built in a full range of popular sizes. All are A.G.A.-approved for natural, mixed, manufactured, L.P. and L.P.-air gases.

GAS-FIRED units that top the field... with *stainless steel* heat exchangers and burners

Compare

EASE OF INSTALLATION

Advanced stainless design makes Modines 50% lighter in weight—more compact than the average of seven other leading makes. Installation is faster, easier — no need for special structural supports. On one job, it cost the heating contractor $600 less to install 66 Modines than conventional units — savings he passed on to the owner.



Compare

PERFORMANCE

EVEN HEATING | MODINE | CONVENTIONAL

Not only do Modine units resist corrosion — all tubes heat uniformly because they're individually fired. Burners have elongated ports with four times the free area of ordinary drilled ports for maximum combustion efficiency. Remember: with Modines you are *sure* of getting full rated capacity.

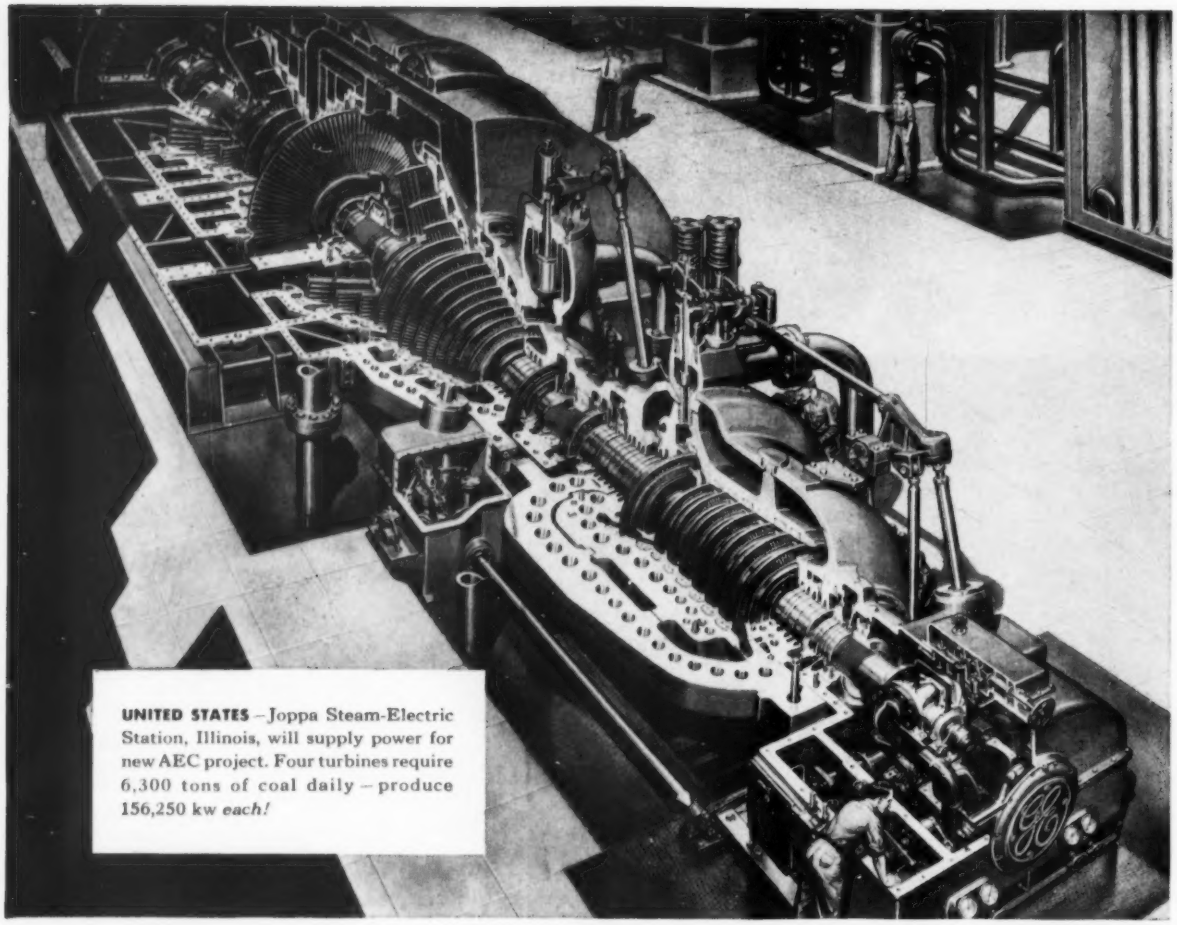
U-1202

Compare ALL-AROUND VALUES

As the leader in the development and application of steam and hot water unit heaters for more than 25 years, Modine brings unequalled experience to gas unit heating problems. It is the *only* manufacturer to publish heat throw data for gas-fired units. For facts, ask for Bulletin 653. Modine Mfg. Co., 1563 DeKoven Avenue, Racine, Wisconsin.

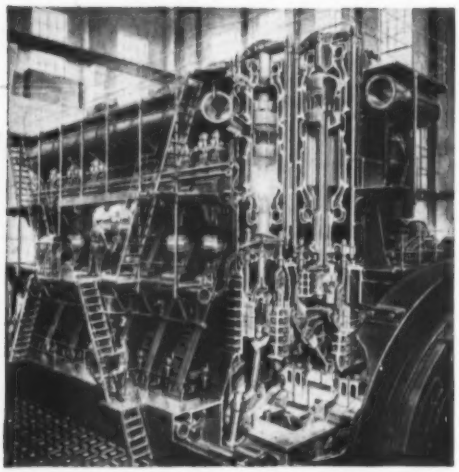
UNIT HEATERS

For more facts circle 507 on Reply Card



UNITED STATES—Joppa Steam-Electric Station, Illinois, will supply power for new AEC project. Four turbines require 6,300 tons of coal daily—produce 156,250 kw *each!*

SEVEN WONDERS OF THE



DENMARK—World's biggest diesel, in Copenhagen, is 38 feet high, 80 feet long with generator and exciter. Eight giant cylinders (33" bore, 58" stroke) can deliver 22,500 hp.—produce 15,000 kw!

Protected by the World's Greatest Lubrication Knowledge and Engineering Service

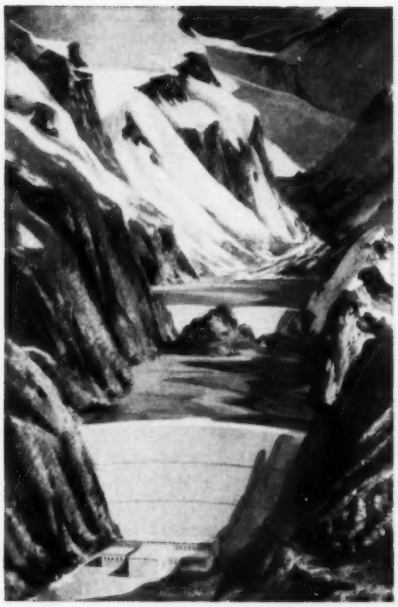
On these pages are pictured seven of the world's most spectacular electric generating plants—truly seven "wonders" of the power world!

Each is unique—a triumph of engineering science...each contains some of the costliest power machinery. That's why Socony-Vacuum was asked to set up a program of Correct Lubrication for each plant.

There are famous Gargoyle D.T.E. Oils for turbines and and diesels...other special Gargoyle oils and greases for auxiliary equipment...plus skilled lubrication engineering service to go with these products.

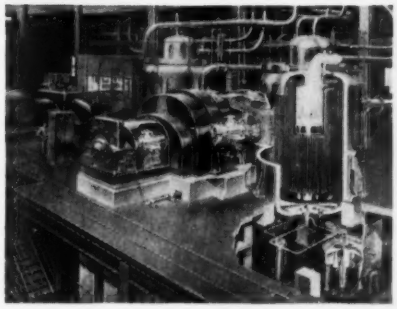
This same kind of unsurpassed lubrication protection is available for *your* plant, mine or mill. Why accept less?

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates:
MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION



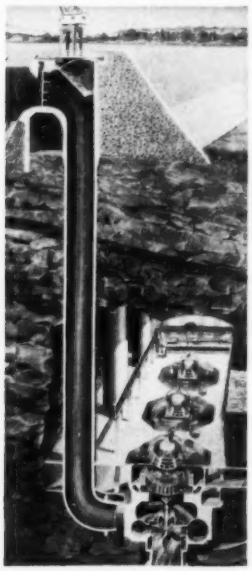
BRAZIL—Cubatao power plant, São Paulo, uses river waters—backed up to edge of high plateau and channeled down through mile-long penstocks—to run 8 turbines. Capacity—474,000 kw.

AUSTRIA—Tauern Power Plant, Kaprun, utilizes waters of melting glaciers to run its turbines—will generate 316,000 kw when finished!



UNITED STATES—World's first mercury unit—power plant teams two 7,500-kw mercury turbines with a 25,000-kw steam turbine. Steam, generated with mercury vapor, is condensed for re-use, runs steam turbine.

POWER WORLD



SWEDEN—Harspranget Station in Arctic, country's biggest, produces 450,000 kw. Water drops 351 feet down vertical shafts to turn underground turbines!

FRANCE—Donzere-Mondragon Power Plant on the Rhone, largest hydro-plant in Western Europe. Six 70,000-hp turbines produce 2,000,000,000 kw hr. annually...an unusual achievement considering the small head, or drop, in the river.

SOCONY-VACUUM

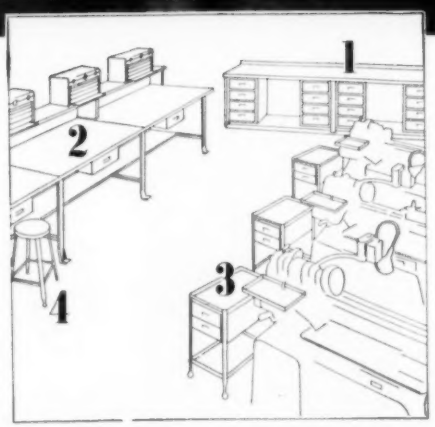
Correct Lubrication

For more facts circle 508 on Reply Card

A MODERN TOOLROOM—CUSTOM BUILT with Standard HALLOWELL Shop Equipment

Design it as you want it—set it up with standard HALLOWELL Shop Equipment. Ample storage space provides protection for your tools and gages, promotes good housekeeping. Let us send you details—then order standard ready-made units from your nearest authorized HALLOWELL distributor. SPS, Jenkintown 26, Pa.

Our Fiftieth Year : A START FOR THE FUTURE



1. Cabinet Benches
2. Work Benches
3. Tool Stands
4. Adjustable Stools

HALLOWELL® SHOP EQUIPMENT DIVISION SPS JENKINTOWN PENNSYLVANIA

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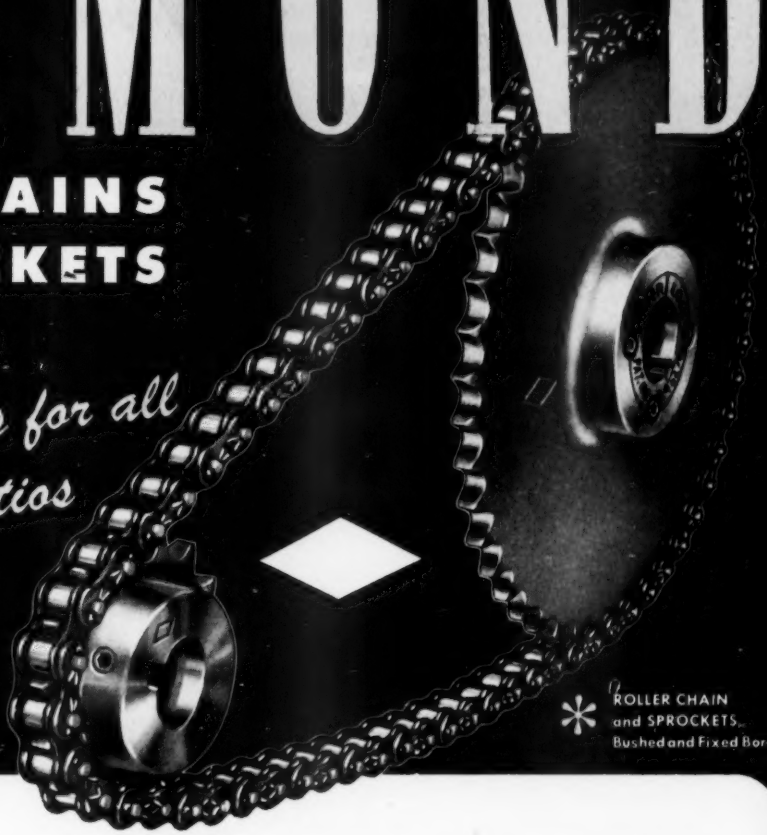
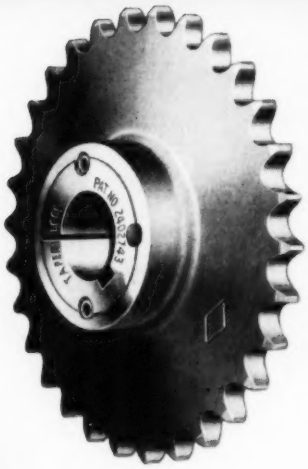
DIAMOND

ROLLER CHAINS AND SPROCKETS

A balanced stock meets requirements for all standard drive ratios and popular H. P. capacities*

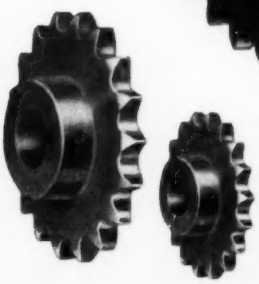


* ROLLER CHAIN and SPROCKETS... Bushed and Fixed Bore



BUSHED SPROCKETS

With the Taper Bore Sprocket and Bushing, the bushing is changed to meet various bore sizes.



FIXED BORE SPROCKETS

Small size Diamond finished fixed bore stock sprockets (with keyways and setscrews) give the distributor the balanced stock to meet the widest possible chain drive requirements.

STOCK SPROCKETS FOR ALL POPULAR SHAFT SIZES

(Taper Lock and Fixed Bore Types)

The Diamond Chain combination of roller chains, taper bore sprockets and bushings, and the fixed bore sprockets in the small sizes provide for emergency and normal service demands for all standard drive ratios and popular horsepower capacities.

Take advantage of the "over-the-counter" availability of this Diamond stock of Chains and Sprockets for new applications and replacements. This stock is as near as your telephone. See the yellow pages of your classified telephone directory for the address of the Diamond Chain distributor.

DIAMOND CHAIN COMPANY, Inc.

Where High Quality is Traditional

Dept. 614, 402 Kentucky Ave., Indianapolis 7, Indiana

Offices and Distributors in All Principal Cities

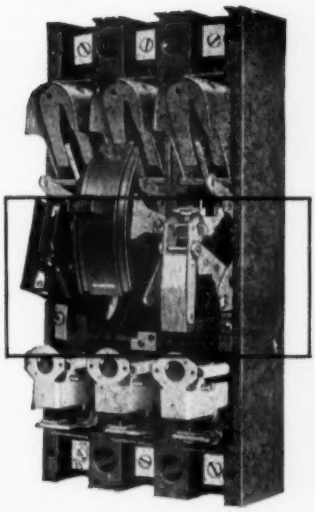
Catalog 753 Mailed on Request

so MUCH more

for so LITTLE more

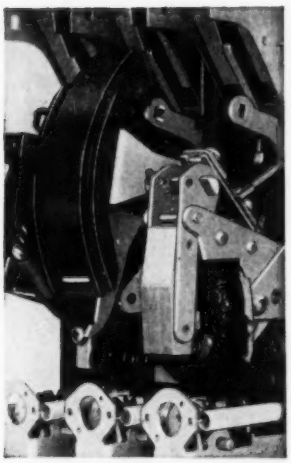
— I-T-E **INDIVIDUALLY ENCLOSED**

when you install I-T-E Circuit Breakers with *internally mounted* extra-protective devices



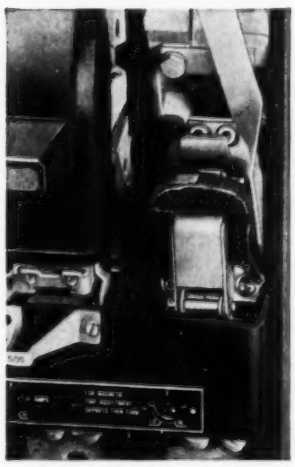
Many applications and processes impose requirements that cannot be met by standard types of electrical protective devices. When you select I-T-E Molded Case Circuit Breakers, however, you have a complete range of special-application auxiliary devices to choose from. The devices fit *right inside the molded case of the circuit breaker!*

I-T-E Circuit Breakers are available with special auxiliary devices—



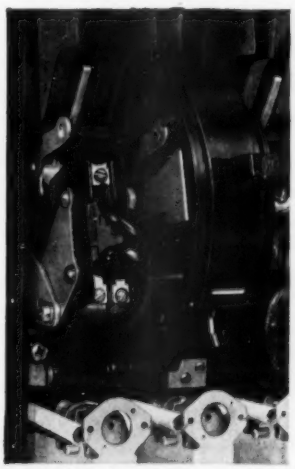
For control of electrical service from any remote point

The I-T-E *Shunt Trip Device* allows one or all critical circuit breakers to be tripped at the push of a button from a control point anywhere on the premises.



For protection against voltage loss

Any unusual voltage drop can be dangerous and costly. The I-T-E *Undervoltage Trip Device* automatically and instantaneously trips the circuit breaker, if voltage drops below a predetermined value. Equipment is protected against possible damage. Personnel are protected too, since equipment won't function until breaker is reset and closed.



For indication of condition of any critical circuit

I-T-E *Auxiliary Switches* can operate indicating lights mounted in any convenient location. Operators can see at all times whether the circuit is ON or OFF.

For signaling upon interruption of critical circuit

If the circuit breaker automatically trips for any reason, the *Bell Alarm Switch* is immediately closed to sound horns or light lights. Attention is attracted to the tripped breaker immediately.

From the 100-ampere "F" frame size —up to 600 amperes, 600 volts

I-T-E extra-protective auxiliary devices can be supplied to meet individual application requirements. Specify I-T-E Molded Case Circuit Breakers. They give you so *much* more—for so very *little* more.

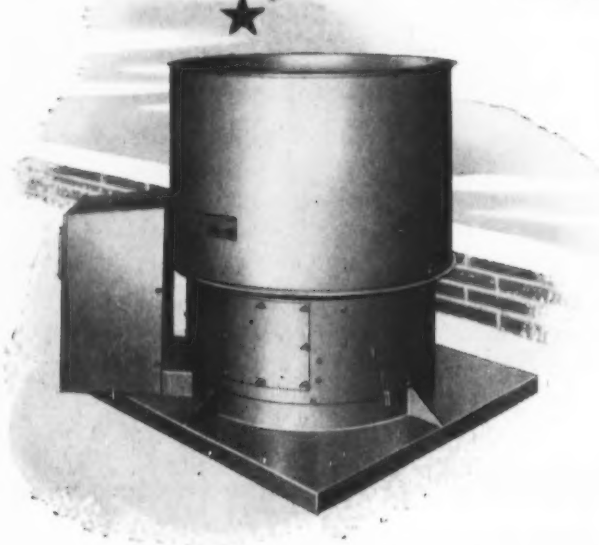
Your local I-T-E Distributor can give you full details. Or, if you prefer, write for *Bulletin 5004D. I-T-E Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia 30, Pa.*

CIRCUIT BREAKERS

AMERICAN BLOWER
Power
Roof Ventilators

Hood type power roof exhaust or supply ventilator.

Upblast type power roof exhaust ventilator.



American Blower *power* roof ventilators give you the advantages of balanced ventilation, without the uncertainties of gravity units or the expense of a central system.

They're quickly and easily installed on all types of roofs. No extensive duct work is required; no valuable floor space is wasted. Use single units for spot ventilation; several units for large area coverage. American Blower power roof ventilators, supply or exhaust, are available in a wide range of capacities. They are designed to furnish balanced ventilation to industrial plants and commercial buildings.

Ask our nearest branch office for data.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary corporation

AMERICAN BLOWER

YOUR BEST BUY IN AIR HANDLING EQUIPMENT

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS

For more facts circle 512 on Reply Card

Remember the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS, INC.

Available in all piping materials!

ALLOY OR NON-FERROUS PIPING is often the answer to problems of contamination, corrosive action, severe pressures and temperatures, or cyclic operation. You can obtain TUBE-TURN Welding Fittings and Flanges of stainless steels, nickel and nickel-base alloys, copper and copper-base alloys, aluminum and aluminum-base alloys, and newest of all, titanium. For good service in welding fittings, in carbon steels, or in alloy or non-ferrous metals, call your nearby TUBE TURNS' Distributor. He's ready to serve you from industry's most complete line.

The Leading Manufacturer of Welding Fittings and Flanges

TUBE TURNS, INC. LOUISVILLE 1, KENTUCKY

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Chicago • Houston • Tulsa • San Francisco • Los Angeles • Denver • Atlanta • Dallas • Midland, Texas

Subsidiaries: TUBE TURNS OF CANADA LIMITED, CHATHAM, ONTARIO • PENNSYLVANIA FORGE CORPORATION, PHILADELPHIA, PA.

ENGINEERING SERVICE

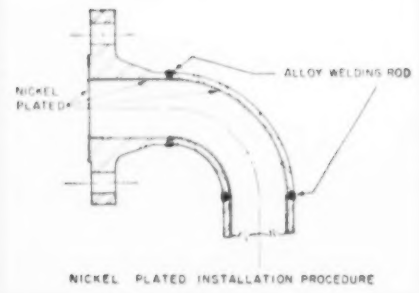
TUBE TURNS' *Engineering Service*

can help you cut cost of corrosion-resistant piping

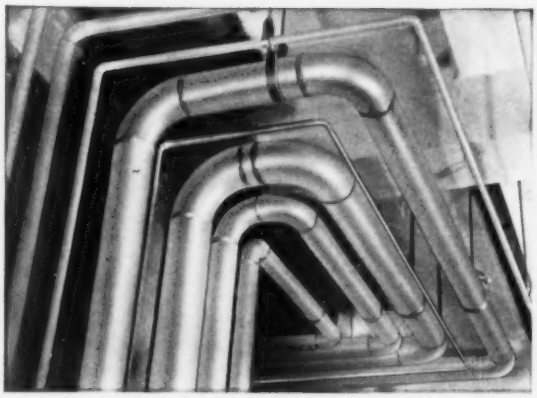
G. A. GAUM is one of TUBE TURNS' Engineering Service Division men spending a great deal of time in the field obtaining performance data that contributes to improved piping technology.

THE COST of corrosion-resistant piping can often be minimized by the use of standard carbon steel piping *plated* on the inner surface with such materials as nickel, copper, etc. In atomic energy plants, nickel-plated piping in sizes through 42″ is giving satisfactory service, and has substantially reduced original cost. The method is also applicable to many industrial processes where corrosion resistant materials are specified.

Such plating is generally .008″ thick, and can be applied in heavier thicknesses where desirable. You can obtain recommendations on preferred plating sources, proper welding techniques and rods from TUBE TURNS' Engineering Service—always ready to help you with special piping problems.



Installation procedure for nickel plated welding fittings and flanges.



These welded aluminum lines, fabricated with TUBE-TURN Welding Fittings, are permanently leakproof, reducing maintenance to a minimum. Since Tube Turns, Inc. offers the world's broadest line of welding fittings and flanges, all necessary types of welding fittings for any job can be obtained from one reliable source.

Dimensional accuracy of TUBE-TURN Welding Fittings speeds fabrication in the shop or in the field. True circularity and uniform wall thickness assure perfect alignment. Each TUBE-TURN welding fitting is individually examined by skilled inspectors for accuracy.

Want Piping Information?

TUBE TURNS, INC. is recognized the world over for its leadership, not only in the field of welding fittings and flanges, but as a source of authentic information on piping design. Check the coupon below for bulletins you would like to receive.

TUBE TURNS, INC., Dept. D-9
224 East Broadway, Louisville 1, Kentucky

Please send me free copy of:

- ☐ Special Alloys
- ☐ Pipe and Fitting Materials
- ☐ Stainless Steel Welding Fittings and Flanges
- ☐ Design Properties of Pipe

Your Name _____

Address _____

City _____ *State* _____

Position _____ *Company* _____

DISTRICT OFFICES

New York	Tulsa
Philadelphia	San Francisco
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Chicago	Atlanta
Houston	Denver

"tt" and "TUBE-TURN" Reg. U. S. Pat. Off.

TUBE TURNS, INC.

LOUISVILLE 1, KENTUCKY

ONE MAN *and* PALLETIER

Get materials where you want them . . . FAST!

Powerful, new Crescent Palletier, built for maneuverability speeds the steady flow of materials from receiving . . . through process . . . to warehouse or shipping. *RESULT*—drastic reduction in handling cost.

why 1 man does the work of 4

Simplified Controls reduce operator "breaking in" time—increase operating efficiency.

Hydraulic Brakes assure operator confidence—increase machine output. A big reason why Palletier daily production records are so high.

Complete Visibility. Operator has clear visibility in every direction whether loading, carrying or stacking. Less fatigue; more accurate work, higher operating speeds.

Palletier has electric or ready power units. 1000 to 8000 lbs. capacity.

INDUSTRIAL TRUCKS FOR EVERY JOB

AISLE-SAVER. Stand-up Model. Extremely Maneuverable. 1000 to 4000 lbs.

LOW HEAD-ROOM MODEL. For highway truck loading and unloading. 2000 to 4000 lbs.

HIGH-LIFT PLATFORM. Telescopic—4000 to 6000 lbs. Non-telescopic—4000 to 10,000 lbs.

LOAD CARRIER. Heavy-Duty utility trucks. 4000 to 10,000 lbs.

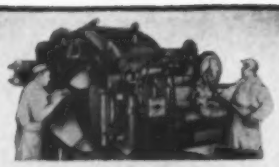
TRACTORS. For trailer towing. Battery powered. For all practical trailer train loads.

LOW-LIFT PLATFORM. For lifting and moving skids. 1000 to 8000 lbs.

CRESCENT TRUCK COMPANY
1045 Willow Street
LEBANON, PENNSYLVANIA

CRESCENT PALLETIER SAVES MONEY

For more facts circle 514 on Reply Card



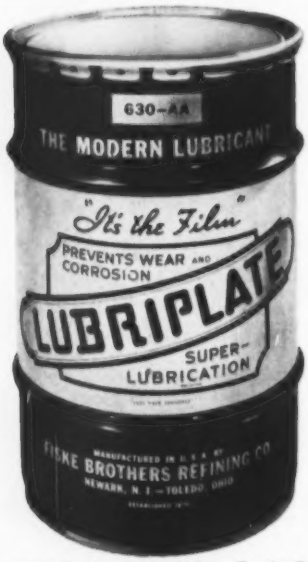
"THIS LUBRICANT INCREASED BEARING LIFE FROM 2 WEEKS TO 2 YEARS"

—says THE GLOBE COMPANY

"Animal acids and moisture, most harmful to ball and roller bearings prevails in the entire meat packing industry. With conventional lubricants, some of the bearings in our Roto-Cut machines did not last two weeks. Since using Ball Bearing LUBRIPLATE in machines operating continuously 24 hours a day for over two years, we have not had a single bearing replacement."

For nearest LUBRIPLATE distributor, see Classified Telephone Directory. Send for free 56-page "LUBRIPLATE DATA BOOK"... a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.



For more facts circle 515 on Reply Card

BACKTALK about our past issues

Edited by R. L. Marinello

Likes Construction Series

PLANT ENGINEERING:

"My friends and I found your article on 'Construction Briefs' by Byron A. Engelbach very interesting, and I would like to have tear sheets to distribute to them." *Walter Sherman, Designer, Calco Chemical Division, American Cyanamid Co., Bound Brook, New Jersey.*

Comment on Oil Seals Article

E. P. STAHL, author of the article "Oil Seals—Their Function, Selection and Operation," recently received the following letter, commenting on his article.

"Someone in your organization sent me a copy of your article that was published in PLANT ENGINEERING in May of this year. I believe that this is one of the clearest explanations of the various types of seals that I have ever read.

"I want to compliment you on being very impartial and very clear in your description of the various possible sealing elements that are used. I would like to be able to pass this article around to all the people in our organization who contact the users of seals, and I wonder if it would be possible for you to send me approximately 50 copies." *W. C. Thompson, General Sales Manager, Detroit Ball Bearing Co. of Michigan, Detroit, Mich.*

"Informative Publication"

PLANT ENGINEERING:

"I have been an engineer for about 25 years, during which time I have constructed many millions of dollars worth of plants. I have always found PLANT ENGINEERING to be an interesting and informative publication." *Ellis E. White, Vice President and Chief Engineer, Multi-Deck Corporation of America, Beverly Hills, California.*

Wants to Remove Heavy Piers

PLANT ENGINEERING:

"We believe that a company advertised in your publication, within the last six months, a product which is designed to soften up tough, steel reinforced concrete.

"It is our desire to remove several fairly large and heavy piers within a building and they do not lend themselves to blasting.

"We would appreciate it if you could help us to find the manufacturer, or could you put this in the hands of other sources that may be able to assist us to accomplish our end." *Fabius Schmerler, Vice President, Cohoes Industrial Terminal, Inc., Cohoes, New York.*

Editor's Note: *Inasmuch as we cannot find any advertisement such as that mentioned in your letter, we have been attempting to locate manufacturers who might be able to help you. Our only suggestions are these:*

First, possibly a sand blast arrangement might be worked out, using an abrasive instead of sand in the sand blast unit.

Also, perhaps you could use Dynatrode, which is an arc welding electrode. This is manufactured by Eutectic Welding Alloys Corp., 172 Street and Northern Blvd., Flushing 58, New York. The electrode is used to pierce concrete, granite, and other like material, although we rather imagine that to completely sever the piers would require a prohibitive amount of electrodes at an exhorbitant cost.

You might also consider the use of the Oxweld Powder Lance, recently introduced by Linde Air Products Co., a Division of Union Carbide and Carbon Corp., 30 East 42nd St., New York 17, N. Y. By the introduction of metallic powder into the oxygen stream, an exothermic reaction is produced which is hot enough to pierce holes in many materials that resist the standard oxygen lance.

Or, what about the possibility of using compressed air blasting like that employed in mines where the rate and power of blast can be controlled by air pressure?

Requests for Bulletin No. 8

PLANT ENGINEERING:

"I have read with interest your article on 'Nylon and Teflon' in the August issue. We have been using this material for some time in certain applications where brass and porous bronze bushings had been used and the results are good.

"We note that there is available a bulletin on how to work nylon and this we do not have. We would greatly appreciate receiving technical bulletin No. 8 of the Polymer Corp." *Earle C. Miller, Research Engineer, Riley Stoker Corp., Worcester, Mass.*

PLANT ENGINEERING:

"As a visitor to the United States, studying methods of fabrication for the food industries, I was interested in your 'Nylon and Teflon' article.

"I would be grateful if you would let me have the publication dealing with the machining of nylon as I am sure it will be of great interest to my colleagues back in England." *A. Saunders.*

PLANT ENGINEERING:

"We are interested in the use of nylon as bearings and in the various methods of machining nylon. We understand that the Polymer Corp. of Pennsylvania has a publication covering the above and that it is available through your office. A copy of this publication would be greatly appreciated." *L. C. Vogel, Process Engineer, Adolph Coors Co., Golden, Colo.*

Wants to Reproduce Article

PLANT ENGINEERING:

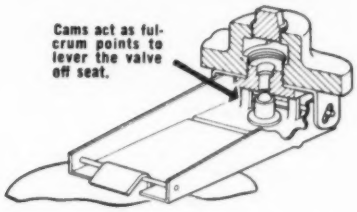
"We read with interest the article 'Can You Afford Combustion Control in Your Boiler Room?' on page 60 of the May issue which tabulated the yearly fuel savings possible using combustion controls.

"We would like your permission to reproduce this article giving you a suitable by-line. It would be our intention to mail it to the consulting engineers which we know among our clientele." *J. A. Morrow, Vice President, Shallcross Controls, Inc., Milwaukee, Wis.*

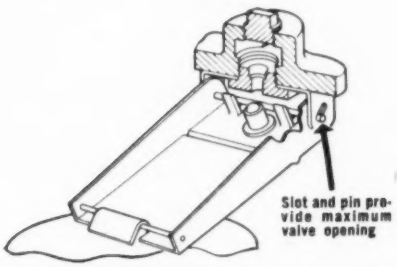
See how this NEW trap handles greater volume in less time

Yet it's small—gives you maximum capacity per dollar cost

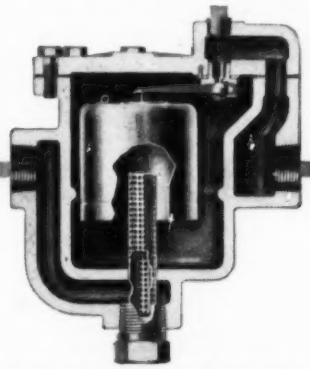
NEW SARCO
INVERTED BUCKET TRAP
with CAMLIFT valve mechanism

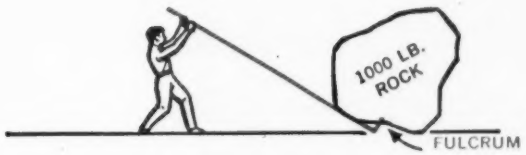


As bucket sinks CAMLIFT mechanism provides the powerful crowbar action needed to open large valve against steam pressure.

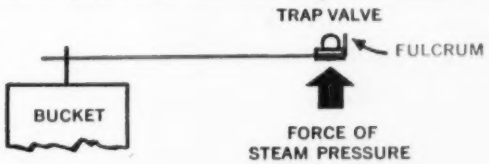


When steam pressure is overcome CAMLIFT mechanism drops to limit of slot, allowing rapid and free discharge of condensate.





MAN WITH CROWBAR MOVES 5 TIMES HIS WEIGHT



TRAP WITH *CAMLIFT* MECHANISM OPENS LARGE VALVE AGAINST MAXIMUM OPERATING PRESSURES

SARCO takes the principle of the fulcrum, incorporates it in its newly designed trap and gives you greater discharge with *no increase in trap size.* That means you get more for your steam trap dollar.

The Sarco *Camlift* valve mechanism makes this possible. It provides the powerful force needed to open the unusually large valve without a corresponding increase in trap size.

If you need a trap that's also rugged and simple in design, then we suggest you try this new Sarco Inverted Bucket Trap – in fact, we'd like to send you one for a free trial. We're confident you'll be convinced. Just clip the coupon and mail it in.

SARCO COMPANY, INC., Empire State Bldg., New York 1, N.Y.
Sarco Canada Ltd., Toronto 8, Ont.
Represented in Principal Cities

MAIL THIS COUPON TODAY FOR FREE TRIAL

Put this new inverted bucket trap to the test—see for yourself how to get more for your trap dollar.

Sarco Company, Inc., Empire State Bldg., New York 1, N.Y.

Gentlemen: Please send me a ½" Sarco Type B Bucket Trap for free trial. Maximum working pressure_____ psi; capacity_____ lbs/hr condensate.

NAME_____ TITLE_____

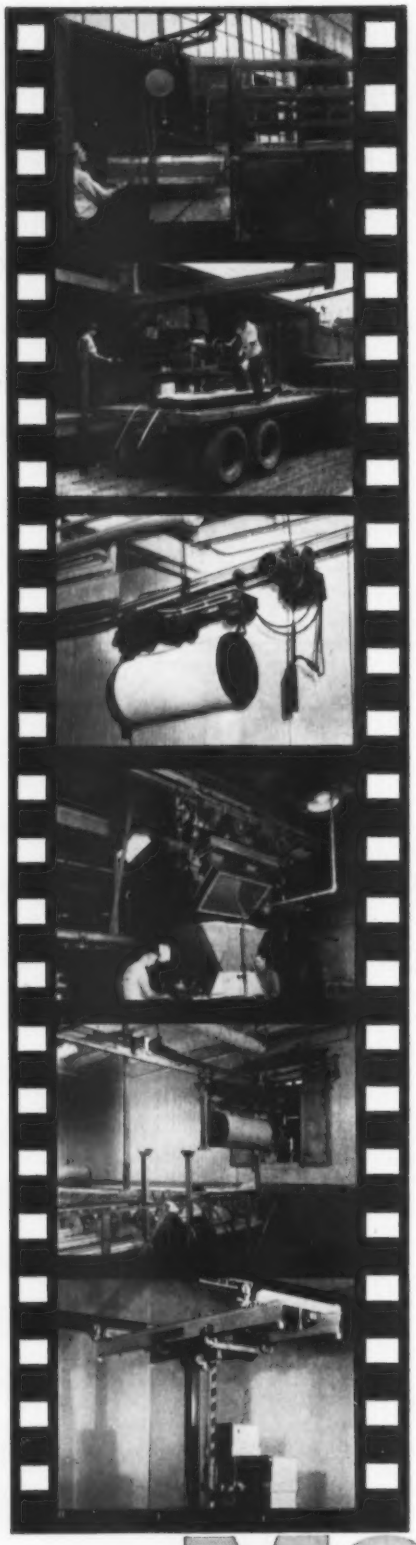
FIRM_____

ADDRESS_____

CITY_____ STATE_____

STEAM TRAPS • TEMPERATURE CONTROLS • STRAINERS • HEATING SPECIALTIES

For more facts circle 516 on Reply Card



Quickly removes die blocks from trucks

Saves $30 each truck unloaded

Delivers beams to another building

Automatic delivery of core sand

Automatic transfer of slasher beams

Stacker crane increases storage by 60%

a 16 mm movie that discusses handling problems common to every industry

Before you decide upon any material handling equipment, let us loan you "Up and Over". This 16 mm film shows many installations of American MonoRail overhead handling equipment. You will see hand operated to fully automatic systems—one or more that may be particularly adaptable to your operations. The film is educational, interesting, informative and shows the way to economical, safe and time-saving material handling. Your ticket of admission is only a note to us asking for a print. It will help us if you advise the exact date, as close as possible, when you wish to use it.

THE AMERICAN MONORAIL COMPANY

13123 ATHENS AVENUE **CLEVELAND 7, OHIO**

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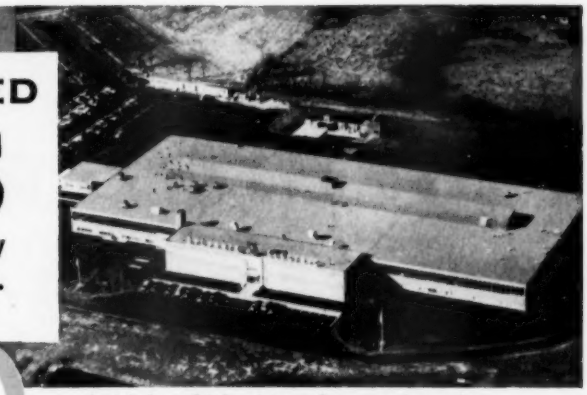
PRODUCTION SPEEDED AT SYLVANIA'S ELECTRONICS DIVISION NEW PLANT AT WOBURN, MASS. with



Aerial view of Sylvania's modern new electronics plant at Woburn, Mass.

Interior of Sylvania's Electronics Division new plant at Woburn, Mass. showing the effective use of Ⓕ Powerplugin and Hi-Efficiency Busduct to carry power from service entrance to all parts of the plant.

Powerplugin and Hi-Efficiency BUSDUCT

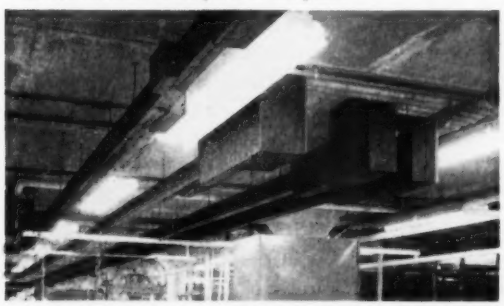
SYLVANIA, like many other companies throughout the country, found that Ⓕ Busduct added greatly to the efficiency, economy, and flexibility of its operations.

That is why the company installed Ⓕ Powerplugin and Hi-Efficiency Busduct in its Electronics Division new plant at Woburn, Mass. and others.

Ⓕ Busduct enables the company to make quick changes in plant and structural layouts without disrupting production. It eliminates temporary connections and long lead-ins, cuts maintenance costs and affords big savings by reducing power loss and voltage drop to a minimum. Too, it is 100% salvageable.

Built in standard ten foot lengths, Ⓕ Busduct can be easily arranged to run horizontally at floor level or overhead, through tunnels, under the street or through walls or roof. Dust-resisting and raintite construction available for specific installations.

If, like Sylvania, you want an efficient, economical, and flexible system of power distribution for your plant, ask your nearest Ⓕ representative, listed in Sweet's to tell you about Ⓕ Busduct.



Ⓕ Powerplugin with a plugin outlet every foot of the way gives Sylvania the efficiency, flexibility and economy of operation so vital today.

Ⓕ Powerplugin and Hi-Efficiency Busduct are available in the following capacities:

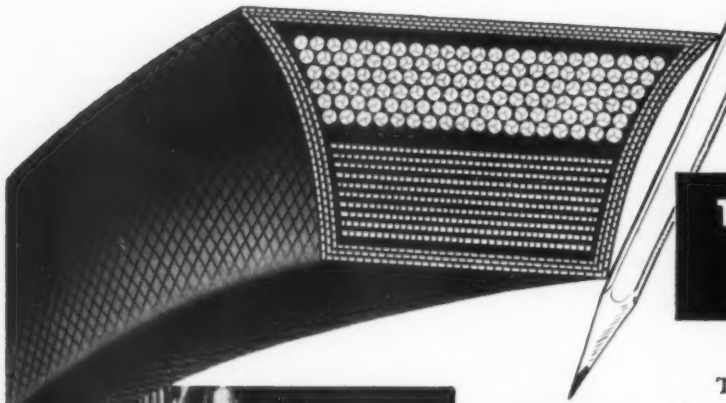
Ⓕ Powerplugin — 250 to 1,000 amperes, 600 volts AC or less, with Klampswitchfuz, (disconnect) Shutlbrak (operating) and Circuit breaker plugin devices for 200 amperes and less, 2, 3, and 4 conductor, solid neutral types.

Ⓕ Hi-Efficiency Busduct — 600 to 4,000 amperes, 600 volts single phase for welding service; three phase or three phase, four wire service for light and power.

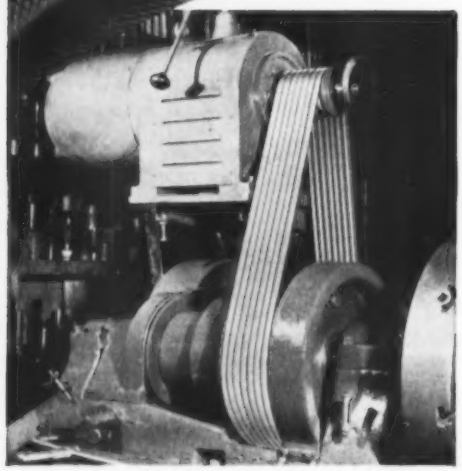
Frank Adam Electric Co.
P. O. BOX 357
ST. LOUIS 3, MISSOURI

For more facts circle 518 on Reply Card

Why Gates V-Belts Wear Longer!



The CONCAVE SIDE
(U.S. Pat. No. 1813698)
tells the story ...



Typical Gates Vulco Rope Drive — the Gates V-Belts are built with Concave Sides to insure longer belt wear.

Take any *straight-sided* V-Belt (Fig. 1). Bend it — as if it were going around a pulley. The sides will at once *bulge out* (Fig. 1-A) — and this causes *extra wear* where the bulge is greatest. (See arrows).

Now bend a Gates Vulco Rope with CONCAVE SIDES (Fig. 2)

Instead of *bulging*, the precisely engineered CONCAVE SIDES merely *fill out* to *fit exactly* in the sheave groove (Fig. 2-A). The sides press *evenly* against the V-pulley so that the *full side* takes the wear — and this means longer belt life and *lower* belt *costs* for you!

When you buy V-Belts, always get the V-Belt with the CONCAVE SIDES — the Gates Vulco Rope!

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and in 71 foreign countries.

CS-539

V-Belts — Hose
Molded Rubber Goods
for industry
World's Largest Maker of V-Belts

Gates® VULCO ROPE DRIVES

THE GATES RUBBER COMPANY • DENVER, U.S.A.

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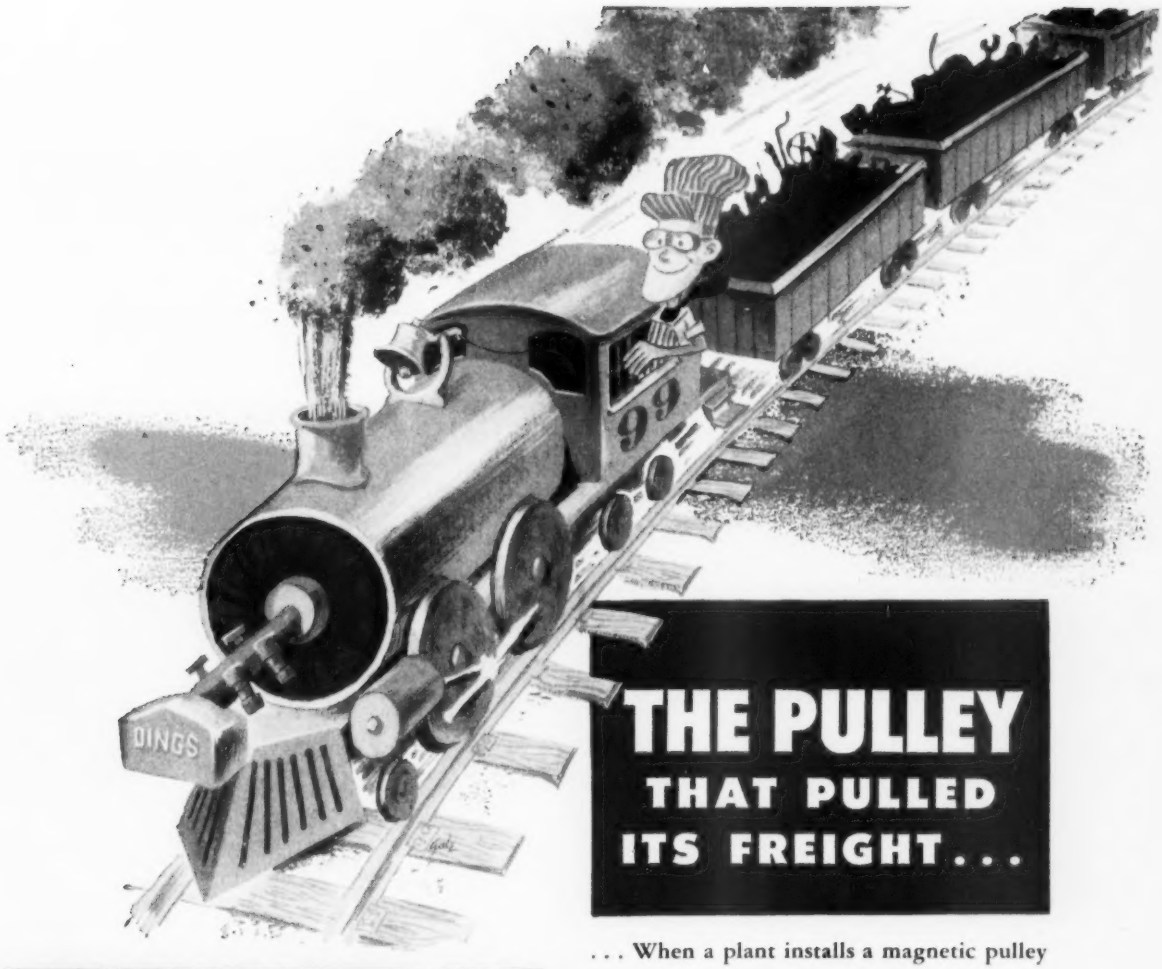
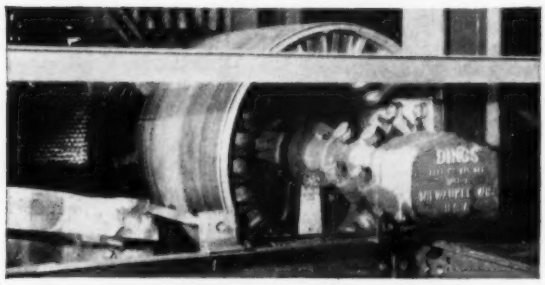


THE PULLEY THAT PULLED ITS FREIGHT...



This is the pulley that pulled its freight—amortized itself in 10 years while giving its owner an annual profit of more than $3.00 by salvaging its costs plus in scrap iron.

. . . When a plant installs a magnetic pulley to protect equipment against tramp iron, the pulley is expected to cost something. But, a West Virginia firm found its Dings Magnetic Pulley recovered scrap iron and tools of sufficient value (about $243 a year) to pay maintenance, power and depreciation costs ($239.64)—and show an annual cash profit of more than $3.00.

Now the Dings pulley is still operating long after being amortized, and it's still bringing in that high annual return in scrap.

What's your tramp iron problem? Dings can solve it profitably. *Ask for Bulletin C-5000-B.*

Dings

ELECTRIC AND NON-ELECTRIC MAGNETS FOR EVERY JOB

DINGS MAGNETIC SEPARATOR CO. • **4766 W. Electric Ave., Milwaukee 46, Wisconsin**

Magnetic Separation Leader for over Fifty Years

FPU389

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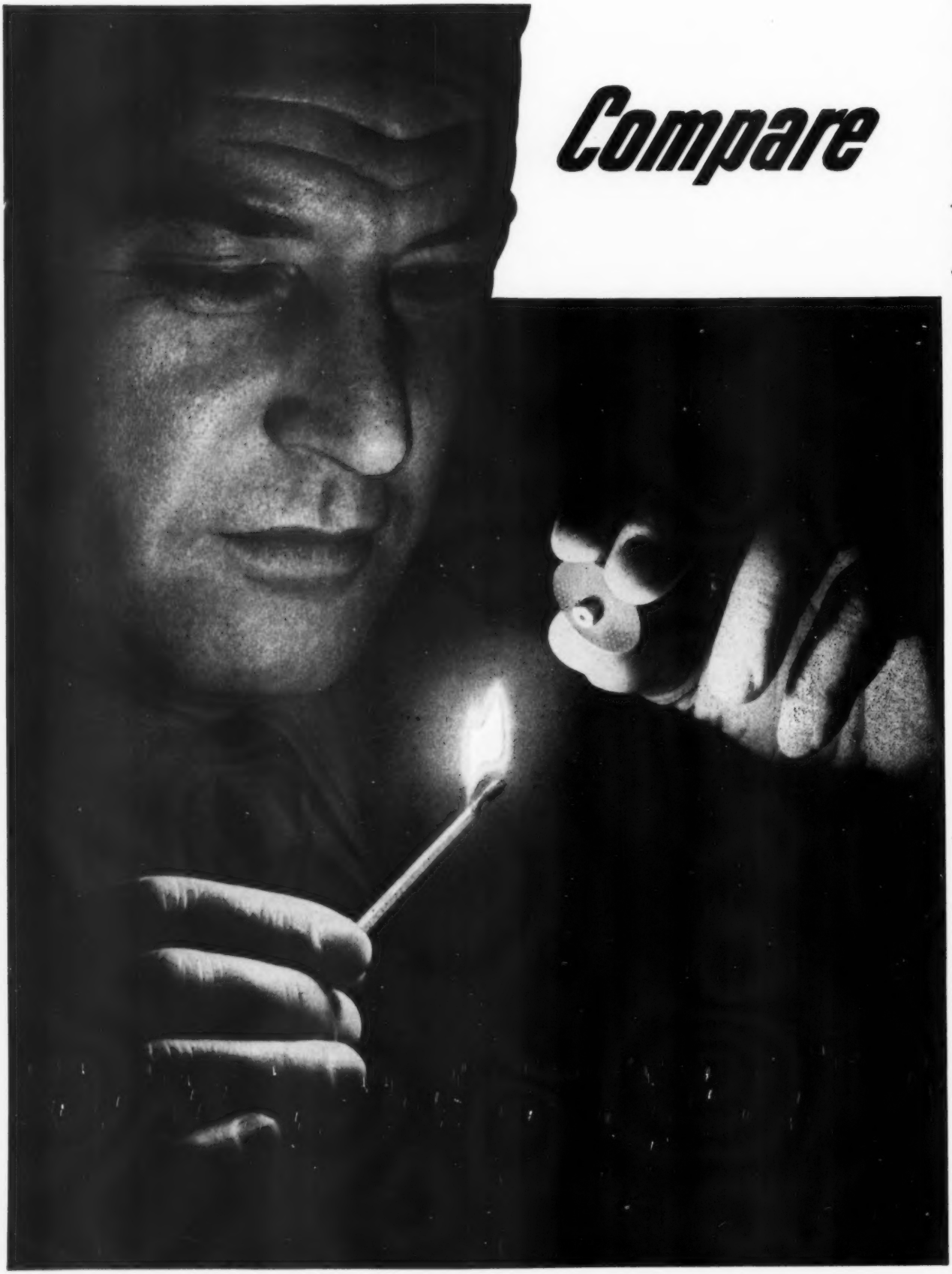

Compare

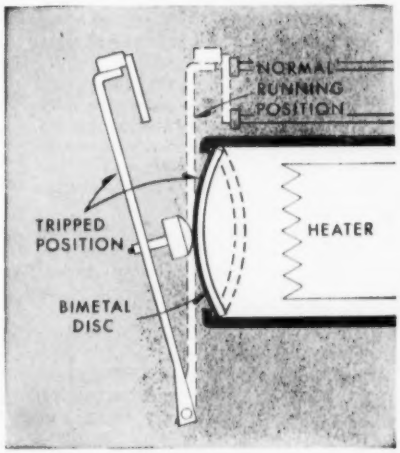
Life-Line starters by this simple demonstration

Proof that Life-Line Starters give you instant, positive motor protection

See this flame test. When heated and placed upon a flat surface, this bi-metal disc will snap up into the air. Here is simple action—demonstrated right before your eyes—powerful, positive action to protect your motors from the destroying heat of dangerous overload.

The bi-metal disc is the nerve center of the overload relay designed into every Westinghouse Life-Line Starter. The disc accurately stands watch over the build-up of motor heat, because a motor can become overloaded. At precisely the right instant, just before a motor may be dangerously overloaded, the disc snaps, as in the flame test. This causes starter contacts to open lightning fast, protecting your valuable motor.

Only Westinghouse Life-Line Starters have the bimetallic, snap-action, disc-type overload relay . . . the most precise motor protective device you can buy. But, just as important, the bi-metal maintains its precision calibration for the life of the starter. It will not fail because it cannot fatigue, age or oxidize. Premature, or "hot" resets can ruin other types of overload relays, such as the solder- pot. Remember—the price of poor protection is smoldering, useless motors, costly motor rewind jobs, other damaged equipment, down time and expensive production pile-ups.



Westinghouse bi-metal principle of overload relay protection, dependable for the full life of the installation.

Proof that Life-Line Starters are tough, maintenance free

Simplicity of design, fewer and more rugged components, only one moving element . . . all spell toughness and long life in Westinghouse Life-Line Starters. Parts that aren't there, can't wear.

Call your Westinghouse Representative to see the flame test. Or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-30146

YOU CAN BE SURE... IF IT'S **Westinghouse**

For more facts circle 521 on Reply Card

PLANT ENGINEERS' DIGEST so those who rush may read and know what's new

Edited by E. B. Skubik

Diesel Engine Lubricants

IN A DIESEL engine the primary functions of the lubricating oil are to reduce friction between moving parts and to dissipate heat. The importance of heat dissipation cannot be over-emphasized.

Almost any mineral oil of the proper viscosity accomplishes these two functions, but various types of oil exhibit widely different characteristics affecting engine cleanliness, wear and lubricant life.

For large, slow-speed diesel engines, straight mineral oils are adequate for satisfactory performance. In the case of modern, high-speed diesel engines, it is apparent that these oils are not meeting the severe operating requirements.

As a result of improved refining techniques and the development of chemical additives, lubricants available today are far superior to those in use five years ago.

Even though additive lubricating oils are more expensive than the straight mineral variety, they are much cheaper to use from an overall economic consideration. A diesel engine can operate on straight mineral oil but the oil service life will be shorter; engine wear rate will be higher; and the frequency of engine overhauls will be increased.

In spite of this, additives are not the answer to all lubricating problems in diesel engines, since with the higher concentration of materials, other difficulties are encountered. However, changes and improvements in diesel engines are inevitable, and needs for improved oils will move along with this.

From an article by Robert A. Pejeau, Cleveland Diesel Engine Div., in General Motors Engineering Journal, published by General Motors Corp., Detroit, Michigan.

Engineers Outsmart Machine

IN A REVERSAL of the modern manufacturing trend toward substituting "thinking machines" for human know-how, costly brainstorms of delicate electronic equipment have been outsmarted by worker ingenuity.

Men have out-thought one of these machines at the Bristol-Myers Company plant at Hillside, N. J., company officials disclosed.

The production line for the company's new dentrifrice consists of an ingenious linking of four integrated machines—a tube filler and crimper, a cartoner, a bundler, and an automatic weight checker.

The critical point of the entire set-up was the costly, complex and delicate tube-positioner. It positioned each tube so that the name Ipana A-C would be panelled evenly on the top of the tube when the end was closed and crimped.

A tiny wire out of place could shut down the whole production line, and it requires time and skill to find the breakdown cause.

Also, the machine occasionally did not position every tube so that the

One of the Bristol-Myers executives points to the electronic device that is no longer necessary for tube panelling

name was properly panelled, and the defective tubes had to be considered wasted. This required constant worker inspection of the tubes. Those improperly panelled were removed manually.

Maintenance engineers were irked

Switching "Bug" Moves 'Em on Right Track for Repairs; Handy Unit Was Built in Shop

Photo: New York Central System

To move coupled switcher, operator uses electric push button station on the side of the hostling unit which was designed and built by railroad employees

ACCORDING to the dictionary, a "doodlebug" can be any one of a number of insects; or, it can be an unscientific device with which it is claimed that minerals or water can be located.

Of course, the "doodlebug" used in the New York Central repair shop for diesel switching locomotives in Niles, Michigan, is not exactly a species of insect; nor is it an unscientific device. Rather, it is a piece of shop equipment especially useful in the repair operations of railroad diesels.

The battery-operated locomotive pushes or pulls diesels for various stages of repairs in the shop. This involves an average of five general overhauls a month.

The unit was fabricated from parts left over from repair jobs. These parts included the batteries which power it. The locomotive is operated by one man who simply keeps a finger on a control button as he walks alongside. *From Exide-Ironclad Topics, published by the Electric Storage Battery Co., Philadelphia, Pennsylvania.*

Wagner

Protected Type Motors

solve tough production problems

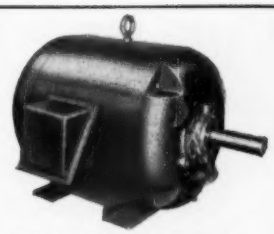
Do you need motors to operate under severe conditions? If you do—you can solve your problem easily with Wagner's complete line of protected type motors.

They are specifically designed for use wherever EXTRA protection is demanded —for bearings or windings . . . against corrosive vapors or abrasive dusts . . . in explosive atmospheres or in exposed outdoor locations.

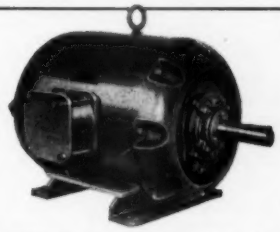
In their specific applications, each of these Wagner Motors assures complete protection of vital parts. Wagner Motors are backed by more than sixty years of motor building experience.

* * *

A Wagner engineer will be glad to help you select the correct motor for *your* specific application. Consult the nearest of our 32 branch offices, or write for Bulletin MU-185 for complete information.

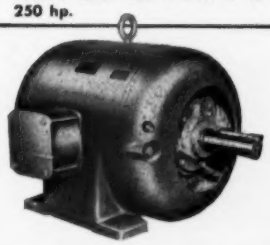


TYPE CP—Totally-enclosed Fan-cooled. Steel frame. 1 to 250 hp.

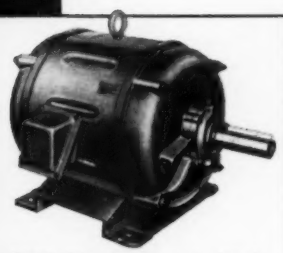


TYPE HP—Explosion-proof. Steel frame. 1 to 250 hp.

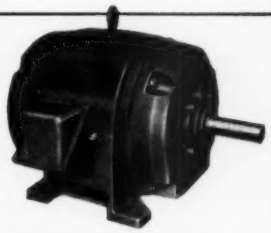
TYPE EP—Totally-enclosed Fan-cooled. Cast iron frame. 2 to 250 hp.



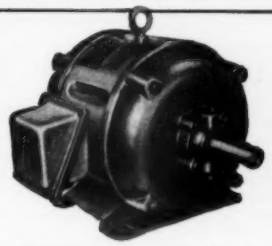
TYPE JP—Explosion-proof. Cast iron frame. 2 to 250 hp.



TYPE RP—Drip-proof. Steel frame. ⅛ to 400 hp.



TYPE XP—Splash-proof. Cast iron frame. ¾ to 200 hp.



TYPE TP—Totally-enclosed, non-ventilated. ¼ to 15 hp.

® Wagner Electric Corporation EST. 1891

WAGNER ELECTRIC CORPORATION
6492 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

M53-10

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PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

by the challenges posed by this machine. Situation was remedied by overcoming the necessity for the entire electronic operation.

This was achieved by designing a new tube on which the product name was imprinted three times, at equal distance around the tube, instead of once as previously.

The entire need for centering the single name imprinting was thus eliminated; no matter how the end was crimped, one of the three imprintings was bound to land on top. In addition, an increase of ten per cent in production capacity was effected. *From a release for the Bristol-Myers Co., Hillside, N. J.*

Shop Sells Safety

Background for this scene is the front of the safety supervisor's office in G.E.'s turbine plant in Schenectady, N. Y. On display in the "store" window are such items as safety glasses, shoes, and samples of other safety equipment used by the employees. (From a General Electric release.)

Bath for the Boiler

SIXTY THOUSAND feet of steel tubes in one of the largest spreadstoker-fired steam generating units in Ohio, recently were bathed and cleaned with a blend of hydrochloric acid, steam and water.

With 12,000 gal of water circulating through these tubes 24 hr a day, sediment is bound to collect. Generally this type of boiler is cleaned by the air turbine method, but in this case, the method is not successful.

When the boiler was shut down for its annual inspection, Dowell, Inc. engineers moved in to clean it. They pumped the inhibited acid through the pipes for almost 18 hr, gently cleaning away the impurities and calciums that had collected during the past year.

Men are standing by truck mounted equipment used in acid washing boilers

It is estimated that the boiler will not need further cleaning for at least two years. *From Circle-News, published by the B. F. Goodrich Company, Akron, Ohio.*

Stabilization of Iron in Water

IRON REMOVAL is the process by which objectionable amounts of iron are removed from water either in one step or a series of steps.

However, for many industrial water uses, it is not necessary that the iron be removed, provided the water can be stabilized to prevent or retard precipitation. Such stabilization of iron can be secured with the use of surface active agents, such as polyphosphates and organic sequestrants.

A complex is formed between the iron present in the water and the surface active agent added. By this complex formation, precipitation of ferric hydroxide can be delayed or, with sufficient treatment concentration prevented indefinitely. Usually, economic considerations limit such stabilization to once-through systems.

In recirculating cooling water systems, the continuous aeration and long retention period so increases the quantity of stabilizing agent required as to make iron removal from the make-up water the more desirable practice.

The quantity of surface active agent required to retain iron in solution will vary according to such factors as the iron content, alkalinity, pH and solids content of the water. Another important factor is the temperature to which the water will be elevated.

In general, the organic iron retention agents are more effective than the polyphosphates. Another advantage of the organic agents is that they can be used at higher concentrations, on waters of high iron and high hardness content, without danger of precipitating calcium phosphate. Under certain circumstances, a combination of organics and polyphosphates represents the most advantageous treatment.

Retention time of the water in the system is another important variable affecting the treatment concentrations require.

In a large plant with many varied cooling operations, and numerous smaller lines at low flow rates, it may be necessary to feed sufficient stabilizing agent to retain iron in solution for 24 hr.

It is advisable to introduce stabilizing material to water prior to its exposure to air and prior to chlorination in order to permit complex formation with the iron as quickly as possible. *From the Betz Indicator, published by W. H. & L. D. Betz, Philadelphia, Pa.*

Paraffin Aids Tube Production

AN UNUSUAL technique, used by Ryan Aeronautical Co. of California, is producing a higher quality product with a saving in time, money and material. This product is a tube which collects fumes from a Boeing B-47 Stratojet wing tank.

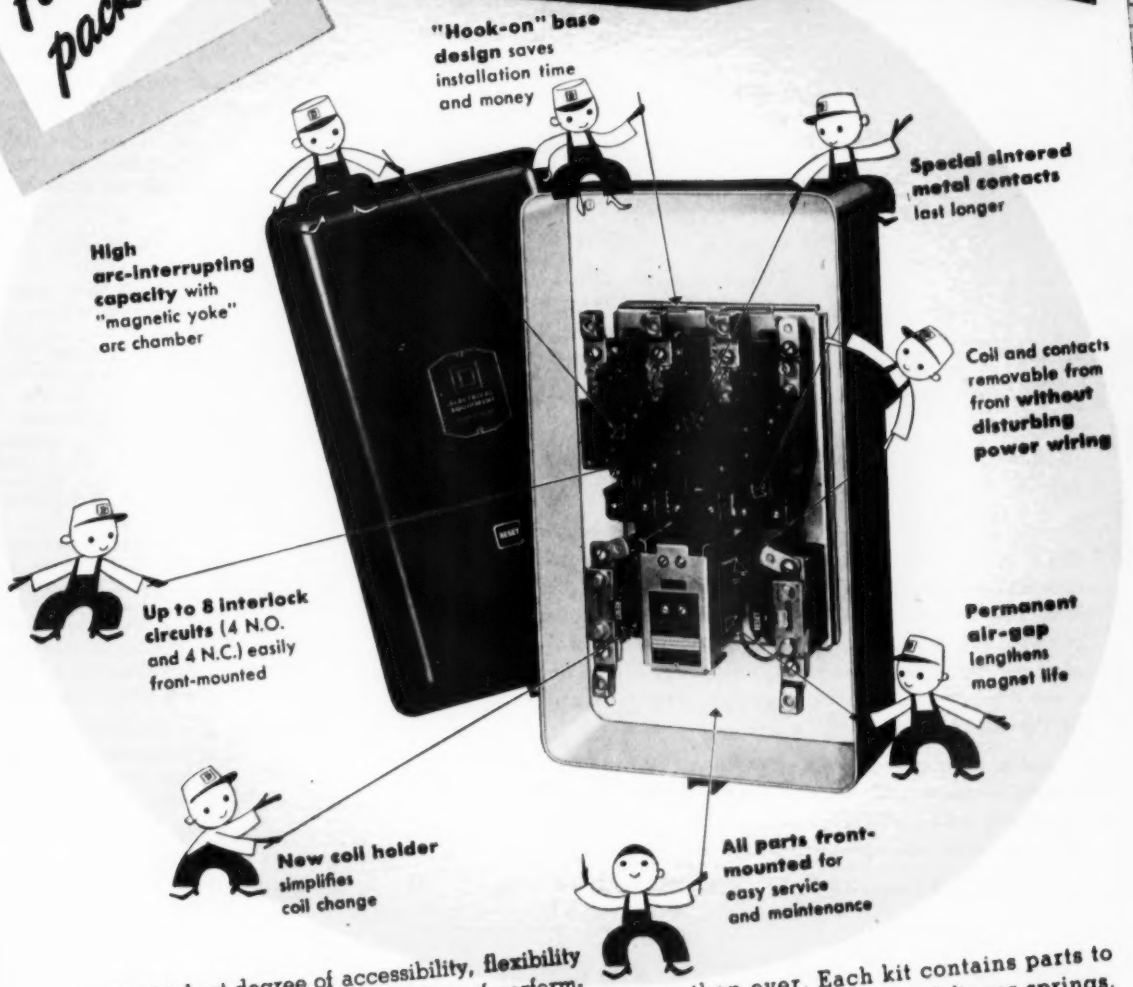
At first, Ryan built these vent tubes from half stampings which were welded together. The weld beads were ground smooth at the tube ends so that attachment clips could be slipped on. However, this method did not lend itself to volume production.

Tool engineer is holding a finished vent tube. Section near hand is circular; those near the tube ends are elliptical

Study disclosed that the job could be accomplished with seamless two-inch diameter tubing if a two-stage forming procedure were employed. In the first stage, the tube would

NEW Square D Size 4 Starter

Feature-packed!


"Hook-on" base design saves installation time and money
Special sintered metal contacts last longer
High arc-interrupting capacity with "magnetic yoke" arc chamber
Coil and contacts removable from front without disturbing power wiring
Up to 8 interlock circuits (4 N.O. and 4 N.C.) easily front-mounted
Permanent air-gap lengthens magnet life
New coil holder simplifies coil change
All parts front-mounted for easy service and maintenance

The highest degree of accessibility, flexibility and compactness—with no sacrifice of performance and long life. That's Square D balanced design—and you'll find it in every size Square D starter.

"Off-the-Shelf" Parts Kits, another Square D convenience feature, make normal maintenance easier than ever. Each kit contains parts to replace all load contacts and finger springs. Electrical interlocks also available in kit form.

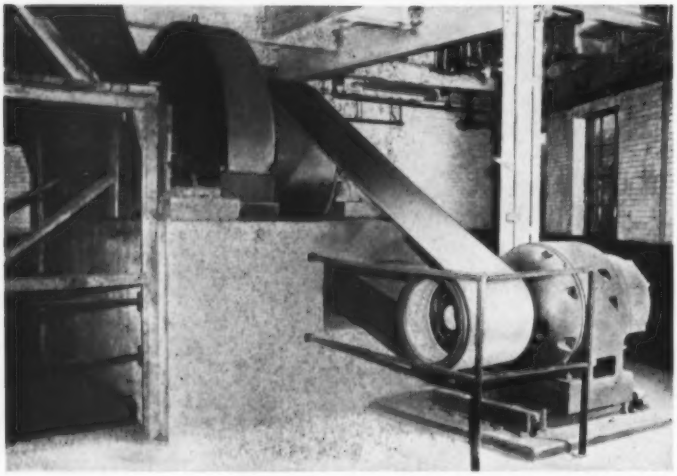
Write for Bulletin 8536, Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

1903 · 50 YEARS OF DESIGN LEADERSHIP · 1953

When you have a belting problem...



Tannate Chipper Drive in Pulp Mill

Consult J. E. RHOADS & SONS

Make Rhoads responsible for all your transmission leather belting. When you do, here's what you get:

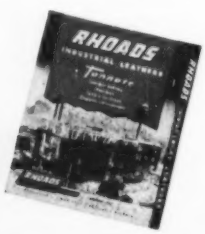
250 years specialized experience that contains a wealth of belting know-how; modern production facilities, research and chemical laboratories, and highly qualified specialists that know leather inside-out; special and exclusive tanning processes that cultivate and strengthen leather's natural characteristics; technical assistance from competent engineers — from designing a new drive to training one of your men in the proper handling of Tannate leather belting.

Actually, our entire plant and personnel — with "rolled-up-sleeves" — go to work for you. It's like having your own belt-producing plant! All these are yours when you call in a Rhoads sales engineer. For additional information, write to

J. E. Rhoads & Sons, 35 N. Sixth St., Philadelphia 6, Pa.

Tannate® leather belting, due to its "custom-manufacture", is *unequalled* for its strong, glove-like grip. Unequalled for its stamina and shock-resisting qualities. Unequalled for its long service and low maintenance. It has the ability to run continuously, delivering a flow of uniform power.

Write for Rhoads complete data file on belting. It explains why, where and how Rhoads belting can serve you best.



RHOADS

INDUSTRIAL LEATHERS

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PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

be expanded in diameter. Then a method would be developed for forming the irregular sections in finisher dies.

In actual practice, the tubing is cut to length, allowing one inch for shrinkage occuring when the sections are expanded in diameter. The ends are burred and the tube is annealed to insure uniform results.

A steel shaft, connected to a hydraulic pressure unit is inserted in the tube. Sealing of the shaft is affected by "O" rings set in tandem grooves in piston like fittings.

The tube and shaft are placed in a steel die which is designed to allow the central portion of the tube to expand to a diameter of two-and-one quarter inches.

Then the whole assembly is placed in a 250 ton hydropress. Hydraulic fluid is pumped into the steel shaft until a pressure of 900 to 950 psi is indicated. Flow direction is then immediately reversed, the die is opened and the tube is removed.

To prevent the tube from wrinkling in forming, it is filled with melted paraffin and allowed to stand in refrigerators until the paraffin has solidified.

Under the impact of a drop hammer, the paraffin exhibits the correct amount of resistance to prevent wrinkling or buckling of the metal and to permit the desired deformation. The tube sections emerge from the dies as smooth, tapered components of prescribed dimensions.

Including all tool costs, the method has resulted in a net saving of more than $15,000 per thousand tubes formed. *From Ryan Reporter, published by Ryan Aeronautical Co., San Diego, Calif.*

On Metallizing

THE METALLIZING process was known in Europe as far back as 1908. However, it remained for an American company to develop its full potentials.

Metallizing or metal spraying is a process whereby any metal in wire form is automatically drawn through a special gun. Outside the nozzle, the wire is melted in an oxygen-gas flame and atomized by a blast of compressed air which carries it to a previously prepared surface.

The particles of the metal "mesh" and form a coating on this surface. And since the air blast also acts to keep the sprayed surface cool, metallizing is known as a "cold" process of building up metal. Two favorable items, high speed and comparatively

(Continued on page 38)

HALL INDUSTRIAL WATER REPORT

Hall Laboratories, Inc.—A Subsidiary of Hagan Corporation, Pittsburgh, Pa.

Volume 1 | OCTOBER 1953 | Number 5

Expert Knowledge Solves Process Problems

A hurry-up call from a Hall field engineer sent C. T. Roland, Pittsburgh headquarters expert on metal preparation and paint finishing to confer with a west coast automobile plant on a paint blistering problem. The sudden occurrence of the blistering baffled the plant engineers until Roland investigated the possibility of a change in the source of the water used in final rinsing of the metal before paint was applied. He found that the quality of the water supply had changed shortly before the blistering developed. Analysis showed that this supply was higher in pH and dissolved solids, particularly sodium chloride, than the water previously used. Mr. Roland's experience in dealing with the action of soluble salts under paint films led to the conclusion that in this case the paint was acting as a semi-permeable membrane, allowing the passage of moisture from the outside surface of the paint to the salty underlayers. Blisters formed wherever the osmotic pressure of the salt solution exceeded the bond of the paint to the metal. The higher alkalinity of the water contributed to the loss of adhesion, promoting further separation of the finish from the metal.

With the cause for the trouble established, recommendations were made to obtain a water supply low in solids until the plant could install equipment to insure the constant delivery of water of suitable quality for this operation.

In another case where specialized knowledge was useful, Ralph Thompson, specialist on paper manufacturing processes, was called in to help a paper mill out of a jam. Their calender rolls, the polished steel rolls that "iron" paper smooth, were corroding. Regrinding to polish the rolls was costly.

Mr. Thompson's on-the-spot investigation revealed that too much alum was being used in the sizing. Alum feed was reduced and the process water was treated with a glassy phosphate corrosion inhibitor. When reliable controls of the modified process were set up, corrosion disappeared.

Water Well Capacity Increased by Treatment With Glassy Phosphate

Initial capacity of new municipal well was recently increased 63% by treatment with Calgon.* Other new wells in the field developed capacity increases up to 34%. In an old well where the capacity had fallen to only 9.5 gallons per minute per foot of drawdown, one charge of Calgon raised the capacity to 31.2 gallons per minute per foot of drawdown, an increase of 228%.

In another case, after acid cleaning had restored a municipal well to approximately the same capacity it had when new, a single charge of Calgon raised the capacity by 100%, or about twice the original capacity of the well.

The dispersive action of glassy phosphate is responsible for its efficiency as a well cleaner. Cleaning with inhibited acid removes deposits of calcium carbonate and iron oxide, but will not affect accumulations of clay, quartz, amorphous silica, mica or silt. These latter are also dispersed and removed by Calgon cleaning.

Hall Is Water Consultant For Asia's Greatest Power Station

India's $35 million power plant, 200 miles north of Calcutta in the Damodar Valley, began operation in February. This is part of an extensive project to hasten the industrial development of a ¼-million square mile area of India.

Alex Henricks, staff engineer serving as consultant for India's new power plant, lifts water sample from container marked "This Package Opened and Examined by Customs at Calcutta."

Engineers and constructors of the station, The Kuljian Engineering Corporation of Philadelphia, have retained Hall Laboratories, Inc. as water consultants.

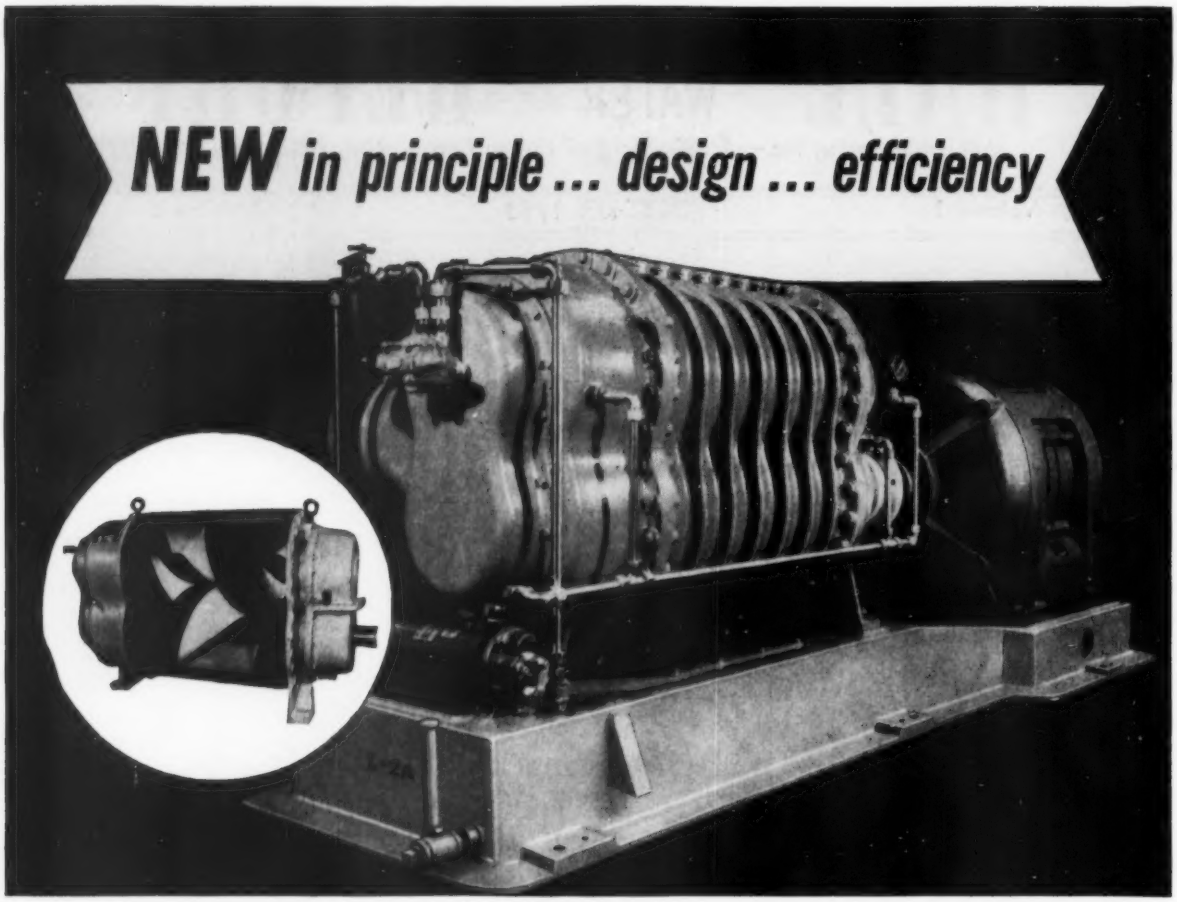
Industrial Water Problems Require Special Handling

There are no "stock answers" to industrial water problems. For information, write, wire or call Hall Laboratories, Inc., Hagan Building, Pittsburgh 30, Pa.

Water is your industry's most important raw material. Don't waste it.

*Calgon is a registered trademark.

NEW in principle ... design ... efficiency



ROOTS-CONNERSVILLE SPIRAXIAL COMPRESSORS

To its widely accepted *dual-ability* line of Rotary Positive and Centrifugal equipment for handling gas and air, Roots-Connersville announces the new SPIRAXIAL Compressors. Based upon the long-proved rotary blower, originally conceived by the Roots Brothers in 1854, but entirely new in operating principles, the SPIRAXIAL design offers several outstanding advantages over present types of compressors, within its range of use:

1. Peak efficiencies at discharge pressure determined by requirements.
2. No internal lubrication used or needed.
3. Minimum of servicing, with wearing parts quickly accessible.
4. Low noise level—smooth operation.
5. Light weight.

In operation, two "spirotors" revolve in opposite directions, and cause internal compression of the air or gas. This principle of internal compression leads to higher efficiencies, which begin to be pronounced at about 10 psi and are more pronounced at higher pressures, with internal compression performance up to at least a 3 to 1 ratio.

These new SPIRAXIAL Compressors increase the flexibility of the Roots-Connersville line and offer possibilities for economy and efficiency which are well worth investigating. We shall gladly study your requirements and make definite recommendations. Descriptive bulletin No. SC-152 on request.

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BULLETINS just released and of immediate plant interest

CONSTRUCTION MATERIALS

101 Translucent Structural Panels—Bulletin 533, 12 pp, describes Resolite, a translucent structural material, corrugated or flat, molded of thermosetting polyester resins reinforced with woven glass fibers. Illustrates use of Resolite in partitioning, skylighting and decorating installations. Provides standard sheet specifications, general information on colors, weights, light transmission and thicknesses. Pictures moldings, rubber closure strips, other accessories. Resolite Corp.

102 For Beauty and Duty—Plexolite, a structural glass fiber plastic material, described as colorful, translucent and shatterproof, is described in this folder. Lists uses of Plexolite, colors, types and sizes available. Also gives data on strength and static load, includes tips on installation. Plexolite Corp. of California.

103 Light Weight Structural Material—This 32-pp brochure presents Aircomb, a honeycomb structure of Kraft paper impregnated with a phenolic resin and, in use, sandwiched between thin facings of metal, wood, plastic or other materials. Stresses Aircomb's high strength-weight and rigidity-weight ratios, its resistance to fire, fungi and pests, also extreme temperatures. Present aircraft, military, construction and other uses of Aircomb are illustrated, also some projected applications. General engineering data, properties, insulation and structural characteristics, weights with various face materials are given. Douglas Aircraft Co., Inc.

104 Multipurpose Steel Framing—Catalog 3 provides more than 80 pp of descriptive and engineering data on StoRack, a steel framing for construction purposes, storage racks, electrical installations and lighting fixtures. Shows how basic channel fittings and framing solve many construction problems and pictures standard fittings and concrete inserts. Includes beam and column capacity data, deflection factors, recommended maximum loads. American Steel and Iron Works.

The Reader Service Card nearby needs no postage. Just circle item numbers of all bulletins wanted. Be sure to include your name, your job title and company name.

ELECTRICAL

105 D-C Motors and Generators—Bulletin 1450, 16 pp, covers ½- to 300-hp motors and ¾- to 250 kw generators. Photos and cutaway drawings show details of mechanical construction, available motor enclosures for different operating conditions, applications, and special d-c designs. Motor-generator sets converting a-c to d-c in industrial service are described. Text and diagrams cover d-c electrical characteristics and show features, advantages, and application of shunt, series, and compound motors. Motor starting information is included. Louis Allis Co.

106 Small Motor Service Plan—Bulletin GEC-972, describes company's motor service plan for fractional- and integral-hp motors and generators; warranties, motors covered by the plan, and fhp motor factory repair service. Service stations in U. S., Canada are listed. General Electric Co.

107 Motor Starters—Features of manufacturer's Type H starters for squirrel-cage, synchronous, wound rotor and multi-speed motors in ratings from 2200 to 5000 v are described in 12-pp Bulletin 14B6410B. Air and oil contactors available with these starters are explained as to operation. Short circuit, overload, time relay undervoltage and pullout protection features are described, and schematic wiring diagrams of typical control methods are included. Allis-Chalmers Mfg. Co.

108 Distribution Transformers—This bulletin describes Class B insulated 80 C rise dry-type transformers in ratings of 3 through 100 kva, single-phase, 600 v and below. Gives construction details, includes stock list. Wagner Electric Corp.

109 Self-Supporting Aerial Cable—Eight-pp Bulletin OK-1064 provides physical and electrical characteristics of self-supporting aerial cables with aluminum conductors. Dimensional information and current carrying capacity tables are included. The Okonite Co.

110 Circuit Breaker—Bulletin 71B7946 gives construction features, ratings, dimensions and weights of power oil circuit breakers designed for outdoor distribution service, and available with automatic reclosing relay equipment. Allis-Chalmers Manufacturing Co.

111 Compact Panelboards—Bulletin VP-450, 12 pp, contains complete descriptive material, dimensional data, horsepower ratings and other information on manufacturer's Vacu-Break panelboards. Explains operation of the arc-snuffing Vacu-Break switch units and compact sliding contact unit. BullDog Electric Products Co.

VALVES, TRAPS AND PIPING ACCESSORIES

112 Lubricated Plug Valves—Revised Catalog PV-2, 12 pp, presents steel and semi-steel valves designed to offer quick shut-off of erosive or corrosive fluids. Explains advantages of the lubricated tapered plug design of these valves and pictures single gland, screwed gland, and bolted gland types. Also shows replacement parts and accessories for these valves and gives prices and dimensions. The William Powell Co.

113 Pressure Relief Valve Selection—A 24-pp booklet, "Selection and Sizing Pressure Relief Valves to Comply with ASME Boiler Code Requirements," provides easy-to-use data for determining output of all types of boilers, tanks and heaters. Formulas and tables cover recommended relief valves for cast-iron and steel boilers, as well as those for which there is no nameplate data or set procedures for establishing the output. Also covers hot water supply heaters and tanks, heat exchangers. McDonnell & Miller, Inc.

114 Steam Trap Service Guide—Bulletin 239, 8 pp, takes much of the guess-work out of trapping. It was prepared for users of company's steam traps. It tells how to install and test them; and gives inspection, preventive maintenance procedures, hints on trouble shooting and repair. Besides

October, 1953

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Use this space to ask for tear sheets, other information wanted.

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regular repair parts lists, new tables give parts identification by dimension, parts interchangeability and pressure change assembly interchangeability. Includes 10 helpful diagrams of recommended trap hook-ups, showing where to put strainers, shut-off valves, by-passes. Armstrong Machine Works.

115 Metal Hose and Joints—Selection and installation data necessary to the application of flexible metal hose and pipeline expansion joints are discussed in Catalog CMH-128, 16 pp. Specifications for low and high pressure units are given, also specification data for corrugated and convoluted hose constructions, information on fittings, and coverage of special purpose assemblies available as standard. Flexonics Corp.

116 Welding Fittings—Twenty-pp Catalog 753 presents a line of stainless steel light weight welding fittings for light gage OD tubing. Provides general information on the fabrication, advantages and availability of the fittings, as well as their physical characteristics. Stresses their strength, light weight, low friction and overall economy. Gives weights, sizes for elbows, tees, crosses, laterals, caps, Y's, returns, reducers, flanges and others. Tri-Clover Machine Co.

117 High-Pressure Fittings—Catalog 553, 28 pp, covers a line of high-pressure tube and pipe fittings. Describes and illustrates company's Prize Pair flare and no-flare type tube fittings designed to seal pressures that will burst the tube. Engineering tables are supplemented with complete specifications on all fittings, and catalog contains helpful tips on selection of proper tubing for a given application, bending of the tube, as well as instructions for making perfect joints. Flodar Corp.

HEATERS, HEATING

118 Direct-Fired Heaters—This 12-pp illustrated booklet presents descriptive and engineering data on a line of warm air heaters. Types covered include a brikset tubular heater, steel enclosed tubular heater, vertical tubular heater, heavy-duty unit heater, universal duty unit heater and special heaters. Includes application suggestions, dimensions and fuel consumption data. Lee Corp.

119 Utility Heaters—Fully illustrated, Catalog 6253 presents heaters for use in mobile units and small space heating requirements. Includes capacity and design information. Young Radiator Co.

120 Electric Circulation Heaters—Typical applications and operating characteristics of company's electric circulation heaters are presented in 8-pp Bulletin 701. Explains how these heaters provide efficient, automatically controlled heating of water, steam, oil, heat transfer media and other gases. Shows methods of installation and advantages of these packaged units for a wide variety of installations. Edwin L. Wiegand Co.

121 On Unit Heater Maintenance—To assist plant engineers responsible for steam and hot water unit heaters, this organization offers a timely folder on their care and maintenance. Pictures various types, gives installation essentials, maintenance procedure, and includes discussion of system corrosion. Industrial Unit Heater Assn.

122 For Better Heating Systems—How to get heat out of that last radiator, have warmer floors, stop heating system noises and stretch the capacity of the burner, boiler and radiation are told in three new bulletins. Bulletin E-353 tells how company's Weather-Flo operates, and results attained. Bulletin F-453 describes its application to hot water systems. Bulletin H-653 describes its application to warm air systems. Automatic Devices Co., Inc.

BOILERS AND AUXILIARIES

123 Boiler-Burner Unit—Sixteen-pp Bulletin B-3133 introduces a boiler-burner unit designed for oil, gas or combination firing, for high, or low pressure heating, power and process steam. Illustrated in color, booklet stresses efficiency of the unit, describes features and provides ratings, dimensions. Iron Fireman Mfg. Co.

124 Heavy-Oil Burners—Bulletin 175-G, 8 pp, covers an extended line of belt-driven, horizontal, rotary-type burners of 12 to 175 gal capacities. Describes outstanding design and construction features of both oil and oil-gas units. An equalizing valve, optional with these burners, is also presented, along with discussion of conditions under which it is of value in improving combustion and reducing noise. Preferred Utilities Mfg. Corp.

125 Packaged Fuel Oil Units—Eight-pp Bulletin 16-H shows how these new units for pumping, heating and straining of fuel oils are designed to provide an efficient and economical means of supplying Bunker C or other grades of fuel to the oil burners. Control and service valves, pumps, heaters and strainers are discussed and a typical elevation assembly is illustrated. Schutte and Koerting Co.

INSTRUMENTS, CONTROLS

126 Central Control Panels—The use of this manufacturer's Panelgraphs in a broad range of industrial control applications is shown in Bulletin PI-153. These panels utilize visual aid techniques to present process information, enabling the operator to comprehend large masses of data and keep process functioning properly. Shows installations in power stations, refineries, chemical industries. Also pictures panel components. Panellit, Inc.

127 Pyrometer Ordering Book—A wide range of pyrometer supplies is illustrated and described in the newly-revised Buyers Guide 100-5, 50 pp. All general thermocouple assemblies and components are listed, as well as many special purpose units. Prices and information on the selection, care, and application of thermocouples are included. Industrial Div., Minneapolis-Honeywell Regulator Co.

128 Television for Gages—Bulletin WG-1813 describes and pictures television equipment for use with company's high pressure water gages. Discusses features of this RCA equipment, describing camera and monitor units in detail. Also shows an arrangement. Yarnall-Waring Co.

129 Electronic Recorder—The Tektolog, an electronic recorder for any purpose requiring graphic recording of a physical measurement made in terms of electrical energy, is described in illustrated Bulletin F-103, 8 pp. Explains how recorder operates and tells features. Both portable and industrial type instruments are pictured, dimensions given. Fielden Instrument Div., Robertshaw-Fulton Controls Co.

130 Meters and Controls—Bulletin 17-E, 16 pp, describes company's line of instruments for metering and automatically controlling process variables. Ranges, basic specifications, and detailed literature references are included. Bailey Meter Co.

131 Radio Control for Trucks—The practical application and advantages of radio remote control for electric industrial

(Continued on page 185)

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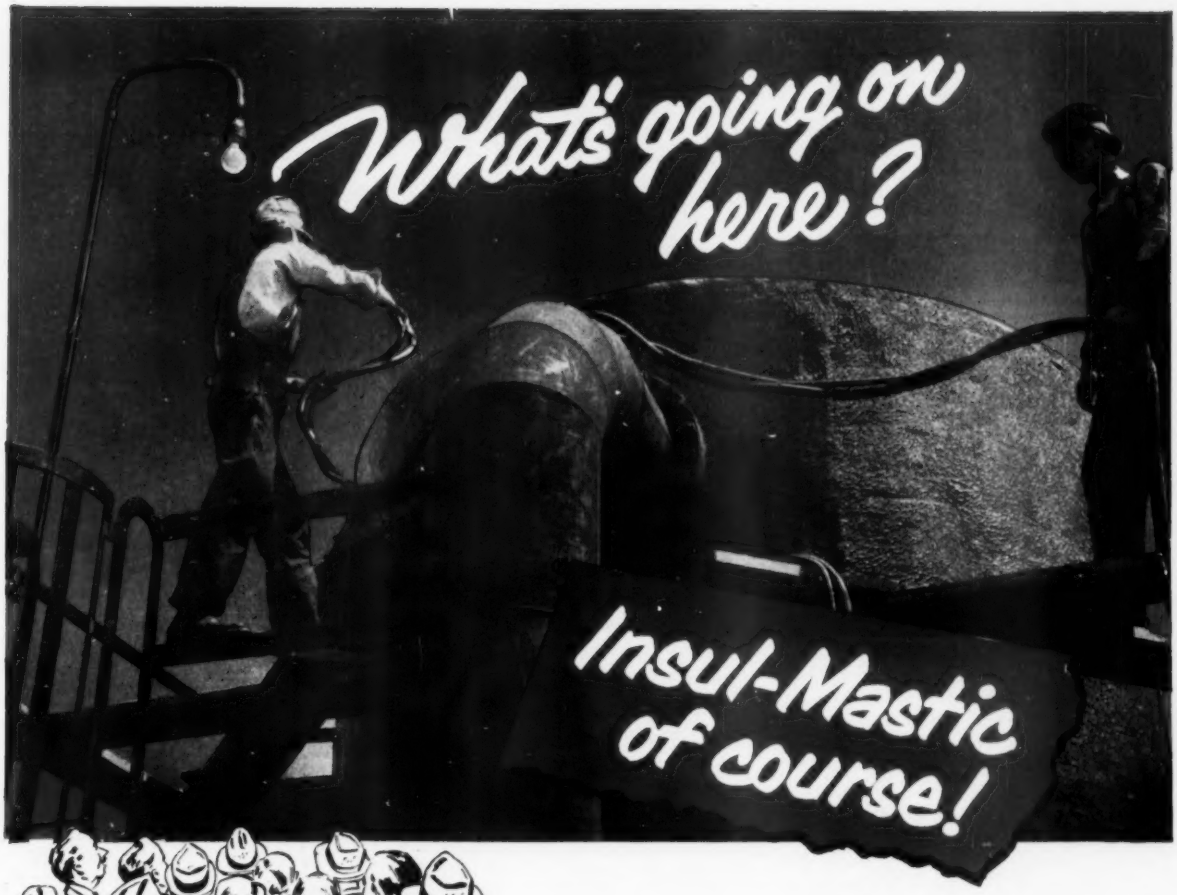

It's going on over thermal insulation as a vapor and weather barrier

Here's how the Aluminum Ore Company at Bauxite, Arkansas keeps absorbent insulation dry. Membraning cloth is pressed into a light coat of INSUL-MASTIC. Then a heavy coat of INSUL-MASTIC is sprayed over this. That ends the insulation worries for years to come.

The insulation stays dry and efficient beneath its INSUL-MASTIC coat. And while it's dry the tank can't rust.

This *Superior* coating gives lasting protection because of its flexibility and its tough fillers, like asbestos, which absorbs physical abuse, and mica, which reflects harmful rays of the sun. Its large Gilsonite content resists industrial fumes and vapors. Weather won't harm INSUL-MASTIC. It will stand 40° F. below zero or 300° F. above. As for being watertight . . . its moisture vapor transmission rate is only .01 grams per 100 square inches per 24 hours per ⅛ inch.

Specify this *Superior* coating for your thermal insulation or to prevent corrosion. Write for our catalog and the name of the INSUL-MASTIC Representative near you.

Think First of the Coatings that Last!

Where less insulation is needed use INSUL-MASTIC TYPE "D". One coat over metal insulates and also prevents corrosion.

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PLANT *Sanitation*

with SPENCER HARTFORD VACUUM

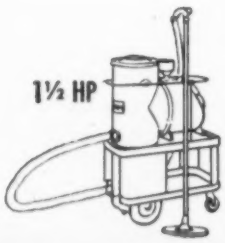
You can improve plant safety and sanitation by recommending Spencer Vacuum Equipment which will save its cost in a few months by increasing production and the quality of the product.

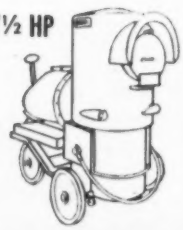
Take the job of handling hot materials, removing fly ash, picking up spilled liquids or handling fine chemical powders. Consider the time saved, the comfort and safety involved when these tasks are done with Spencer Vacuum.

Then consider that these Spencer machines will clean your plant and your machines at night—faster and at lower cost. That you can reclaim foods, chemicals, and metals, can speed up the assembly and inspection lines—in fact you can be sure that not only your plant, but your finished products are always clean.

Spencer representatives have special information on more than 100 special applications that can improve your plant sanitation and increase production.

Send for Bulletin No. 144 describing 132 unusual uses for Spencer Vacuum in industry.





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SPENCER HARTFORD

466-A

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PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

Workman is seen metallizing casting

low cost of metal spraying make possible impressive savings of time and money in the repair and salvage of machine parts.

The sprayed metal generally has greater-than-normal particle hardness which results from a "case-hardening" action. In addition a microscopic surface porosity results in excellent lubricating characteristics due to the retention of oil in the tiny pores of the metal coating.

Another advantage is the fact that superior metals like stainless steel and nickel can be sprayed on parts made of ordinary metal and impart on their surfaces most of the physical advantages of superior metals.

Until 1949, the principal method of preparing a surface for metallizing to insure a good bond was to treat it mechanically by threading, grooving or blasting with sharp sand or steel grit. That year, however, the development of Sprabond Wire was announced.

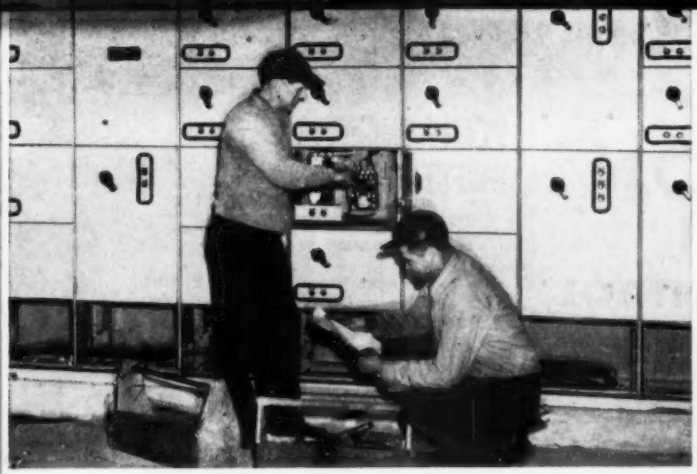
This wire bonds itself—even to smooth, highly polished surfaces—and provides an ideal preparation surface for the application of any other sprayed metal.

Few other industrial processes in the nation have contributed so much to the conservation of metals and the restoration of equipment made from metals. In 1933, there were only 600 users of metallizing in the U. S. Today, more than 6,000 top industrial plants employ the process. *From Steel Horizons, published by Allegheny Ludlum Steel Corp., Pittsburgh, Pennsylvania.*

Powdered Metal Parts

MORE THAN 90 different parts are now produced from powdered metal at the National Cash Register Company plant at Dayton, Ohio.

Production operations have been greatly simplified through the use



EASY-TO-INSTALL front-connected units and a large, accessible 13-inch conduit space make wiring fast. Lightweight, compact, strong units with stab-on connectors make handling easy.

A G-E PACKAGED JOB and proven dependability of G-E motor control centers sold the planning team of George Sall Metals Company and Kuljian Corporation engineers on specifying G.E.

STEEL BARRIERS isolate live busses from personnel for maximum safety during inspection and maintenance. Disconnect position allows safer maintenance without shutting down the center.

G-E Motor Control Centers Specified For New "Automatic" Processing Plant

The Kuljian Corporation, Philadelphia, engineers and constructors, specified G-E motor control centers to help in the "automatic" processing of scrap metal at the non-ferrous smelting plant of The George Sall Metals Company in Philadelphia. Like other industries—chemical, paper, automotive—where automatic control is important, George Sall Metals wanted the most modern up-to-date equipment available. They had the plant planned for the ultimate in economical and automatic processing.

Whether you are building a new plant or modernizing existing facilities, specify G-E motor control centers for centralized control of a-c motors up to 200 horsepower.

FOR MORE INFORMATION, contact your nearby General Electric Apparatus Sales Office or authorized distributor, or write Section 781-5 for Bulletin GEA-4979A today. General Electric Company, Schenectady 5, New York.

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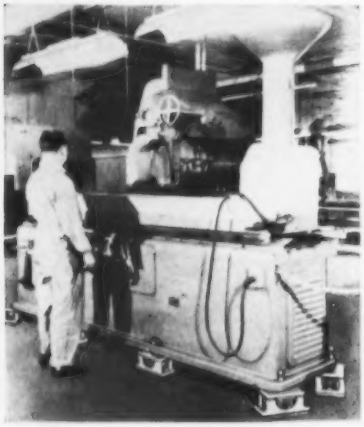
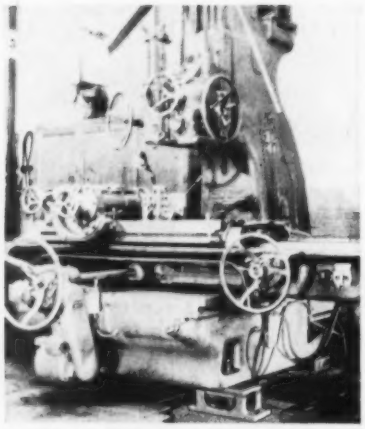
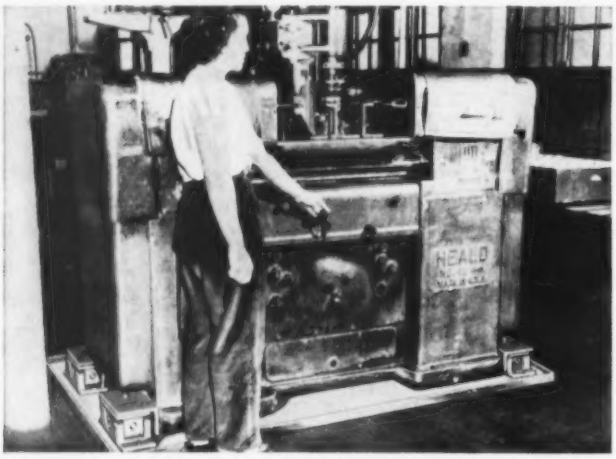
STOP VIBRATION
WITH
KORFUND VIBRATION CONTROL



This Thompson 12" x 60" Surface Grinder is installed at Firth Sterling, Inc., Pittsburgh, Pa. Vibration from grinders affected precision testing equipment on floor below; vibration and noise was also extremely annoying in executive, sales and laboratory offices. Korfund Isolators directly under the grinders, completely solved the problem. Korfund Units stop vibration and insure quieter machine operation.



This Pratt & Whitney #3B Jig Borer is installed at Caterpillar Tractor Co., Peoria, Illinois. Korfund Vibro-Isolators protect this precision machine against severe external vibration from trucks and trains which had made accurate work impossible. Isolators are set in pockets made by removing wood block flooring. Korfund Units stop vibration and reduce rejects—improve work quality.



This is one of the Heald #49 Bore-Matics installed at Thompson Products Co., Cleveland, Ohio. Shock transmitted from one automatic boring machine to another caused intermittent skips and gouges. One machine had to be kept idle until both were mounted on Korfund Isolators. Now they operate together and turn out perfect work. Korfund Units stop vibration and increase production.

Korfund Vibration Control also: permits more efficient plant layouts, decreases original building and foundation costs, permits installations without reinforcement of floors, reduces machine maintenance costs, and lengthens machine life.

Standard Korfund Isolators are available for most applications. A Selector Chart giving recommendations for both normal and critical conditions is available. See Sweet's Catalog Files or write us for Bulletin No. 5.

For specific recommendations, contact us or your local Korfund office. A half century of experience is at your disposal.

THE KORFUND CO., INC.

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

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For more facts circle 530 on Reply Card

PLANT ENGINEERS' DIGEST

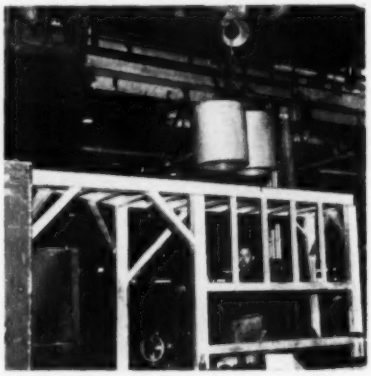
(Digest begins on page 28)

of this method, primarily due to the fact that it is so highly automatic. The number of operations required to produce a given part has been reduced and the speed of production increased.

Surface finishes of powdered metal parts have been found, in many cases, to be as good as ground surfaces at this plant, resulting in a reduction in tool costs. The number of tools, jigs, and fixtures required to produce parts is now much fewer, and tool life is reported to be extraordinary.

It has been found that many parts can be reproduced from powdered metal much more economically, within closer dimensional tolerances, and with less trouble than by other methods. *From Stokes News, published by F. J. Stokes Machine Co., Philadelphia, Pennsylvania.*

Enclosure Protects Operator



Pickler operator at the Chase Brass & Copper Co. plant in Waterbury, Conn. is being protected from the danger of falling coils by a steel cage. The protective enclosure came as a suggestion from a plant safety committee. (From Chase News, published by Chase Brass & Copper Company, Waterbury, Conn.

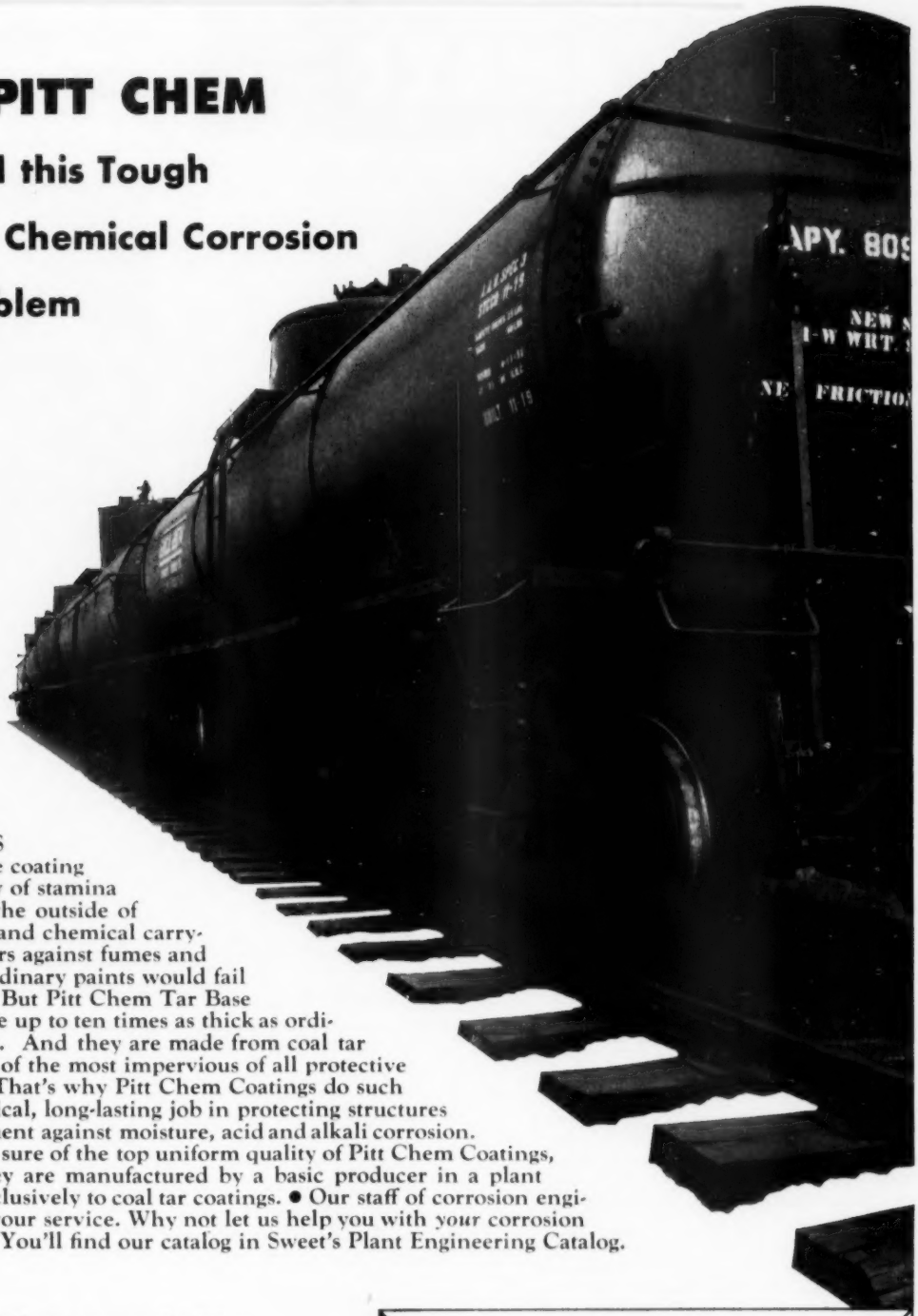
Mechanical Forging Helper

HEATING a piece of steel to make it malleable and then hammering it to shape is the basic process even today in forming many types of axles, shafts, wheels and gears. While a heavy duty steam hammer has long since replaced the blacksmith's sledge, it has taken longer to evolve a machine-age version of the brawny hand that held and turned the work under the hammer blows.

In the forge shop of a Pennsylvania steel mill, one of these man-made versions is a nimble buggy that handles steel ingots. Concocted

PITT CHEM

Licked this Tough Chemical Corrosion Problem



IT TAKES a protective coating with plenty of stamina to protect the outside of these acid and chemical carrying tank cars against fumes and spillage. Ordinary paints would fail in months. But Pitt Chem Tar Base Coatings are up to ten times as thick as ordinary paints. And they are made from coal tar pitch—one of the most impervious of all protective materials. That's why Pitt Chem Coatings do such an economical, long-lasting job in protecting structures and equipment against moisture, acid and alkali corrosion. You can be sure of the top uniform quality of Pitt Chem Coatings, because they are manufactured by a basic producer in a plant devoted exclusively to coal tar coatings. • Our staff of corrosion engineers is at your service. Why not let us help you with *your* corrosion problems? You'll find our catalog in Sweet's Plant Engineering Catalog.

PITT CHEM 101—For Severest Conditions
PITT CHEM 102—Maintenance Coating
PITT CHEM 103—General Purpose Coating
PITT CHEM 104—Potable Water Service
PITT CHEM 105 AQUATAR—A Water Dispersion
PITT CHEM 106 TARMASTIC—Sealing Compound
PITT CHEM 107 PACHKOTE—Specialty Coating
PITT CHEM 110—Specialty Coating

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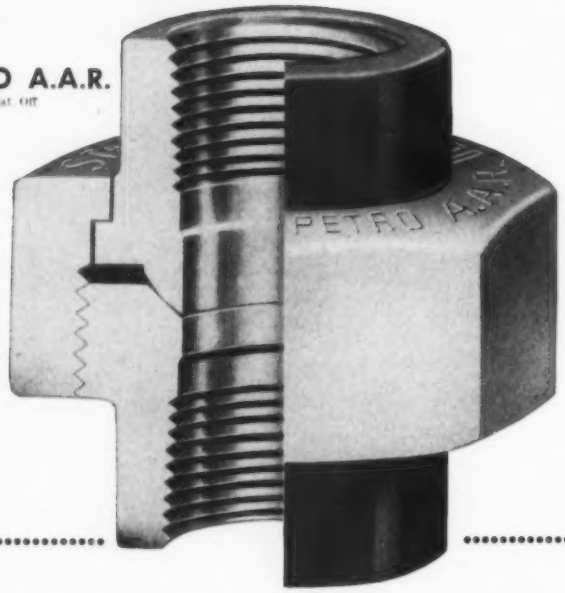
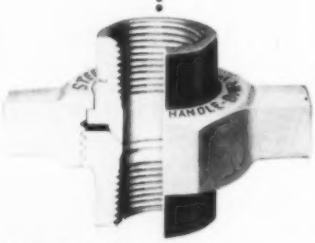
PETRO A.A.R.
Reg. U. S. Pat. Off.



PETRO A. A .R. conforms to a recognized American standard, the Association of American Railroads (better known as A. A. R.) and will interchange, part for part, with all other manufacturers' A. A. R. unions. Standardize on A. A. R. and you will never be dependent on any one manufacturer or supplier to maintain interchangeability of parts and dimensions.

HANDLE-BAR 4000 Test Forged Steel Unions made from A. I. S. I. 1023 forging steel. Machined and cold rolled seat. Modified Acme threads in nut. Nut threads rust-proofed, spark-proofed and permanently lubricated with Udylite Cadmium. HANDLE-BAR 4000 Test forged steel unions are priced lower than any 1000 or 2000 Test quick type unions. Check prices and compare unions. Specify HANDLE-BAR and save the difference.



Sizes ⅜" to 4"

For additional information about these and other Forged Steel Unions write Department P. for Illustrated Catalog or refer to listings in Composite Catalog pages 3194-3195, Refinery Catalog page 695, and Chemical Engineering Catalog pages 1294-1295.

ORDER BY TRADE NAME FROM YOUR LOCAL JOBBER

ORIGINATORS AND PIONEERS OF STEEL UNIONS SINCE 1912

CLAYTON MARK & COMPANY

1900 DEMPSTER STREET • EVANSTON, ILLINOIS

For more facts circle 532 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

This buggy, improvised by company mechanics from an old truck chassis, speeds forging of heavy steel shapes

by the company's mechanics, the buggy is basically an old truck chassis turned the wrong end around. Mounted on what is now the front end is a heavy steel boom that terminates in a pair of powerful gripping jaws. Two 100-pound hydraulic pumps permit the operator to raise and lower the boom and also to twirl the jaws around in a circle.

With this buggy, one man takes three hours to do a forging job which used to take eight men eight hours with a crane and tongs. *From Steelways, published by American Steel and Iron Institute, New York.*

Rubber Joins Steel Against Abrasion

CYCLONE SEPARATORS are used to handle screenings for the Topeka Mill and Elevator Co. of Topeka, Kansas. To get to the cyclones, they are blown through 96 ft of duct which includes an elbow at the end of the run.

Originally the elbow, with an eight inches square cross section and a three feet radius of turn, was made of 16 ga steel. It was built with a replaceable flat steel plate on the outside. This plate lasted about three weeks and cost about $45.00 to install.

Then the superintendent and the maintenance foreman were informed about rubber faced plate. As a result a sufficient amount was ordered to make a replacement elbow for the screenings separator line. The outside plate lasted 26 months and other parts of the elbow did even better than this.

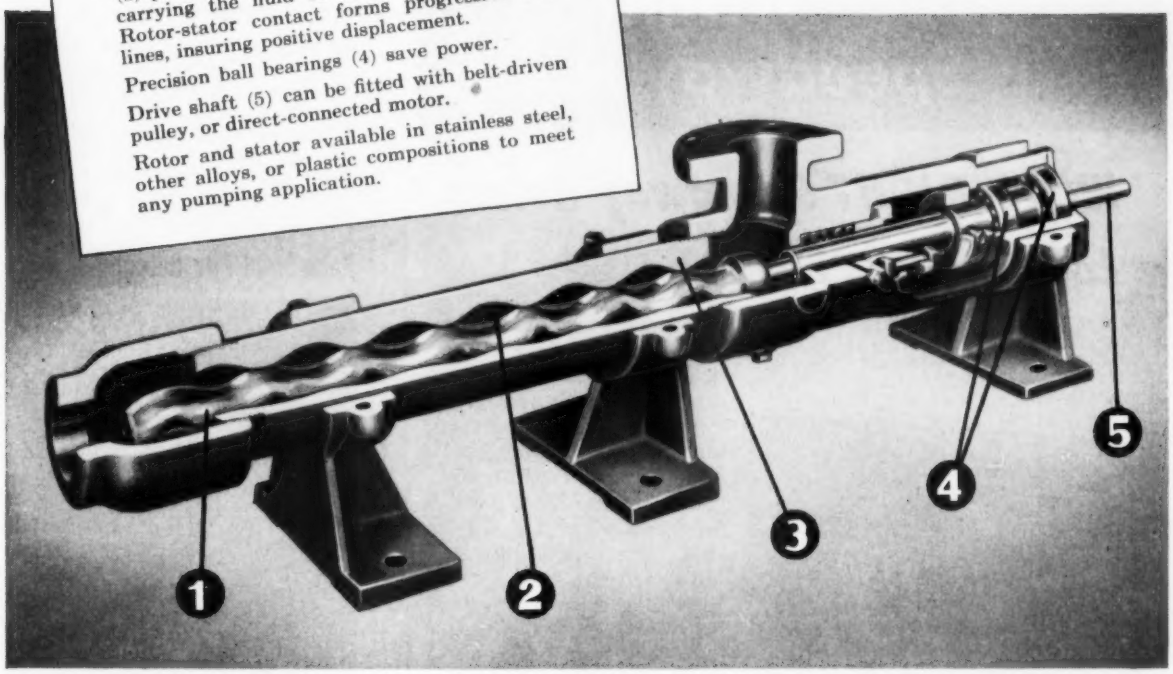
A little quick figuring shows that at $45.00 for three weeks service, the ordinary steel plate was costing $15.00 a week to maintain. To last as long as the Gates rubber lined

How it works: as the rotor (1) turns, cavities (2) progress toward the end of the stator (3), carrying the fluid or semi-solid with them. Rotor-stator contact forms progressive seal lines, insuring positive displacement.

Precision ball bearings (4) save power.

Drive shaft (5) can be fitted with belt-driven pulley, or direct-connected motor.

Rotor and stator available in stainless steel, other alloys, or plastic compositions to meet any pumping application.



If your pump requirements are a little different...

The entirely different MOYNO® Pump may be exactly what you need!

FACTS ABOUT THE MOYNO

the world's simplest pump

- **Positive Displacement**—Moynos are available to pull up to 29 inches of vacuum while discharging under pressure. Big Moynos can deliver up to 250 gallons per minute, against pressures up to 600 p.s.i.
- **Gentle**—no churning, foaming; won't break up semi-solids.
- **Reversible**—pumps with equal efficiency in either direction.
- **Trouble-Free**—self priming; won't cavitate or vapor-lock. Just one moving part—no valves to stick, no pistons to gum up. Built for tough service, easy to maintain.
- **Versatile**—handles liquids, pastes, abrasive-laden slurries, vacuum applications.

You name the problem! Are your pumped materials viscous, semi-solid, hard to move? Do they tend to disintegrate? Are they abrasive? Do pump maintenance costs seem high? If "yes" is the answer to any of these, find out why Moyno Pumps handle jobs where other pumps fail!

The Moyno is different! The cutaway view above—and the facts listed at left—describe a completely new concept of pump design. They show why the Moyno is a pump you can specify, install and *forget*.

Will it solve your problem? Chances are it will . . . at least there isn't a more versatile pump made! Moynos pump clay for a leading pottery maker. They're being used for handling white water in paper mills . . . for caustics . . . an Eastern food producer is even using them successfully for pumping potato salad!

Get more facts today! An interesting, factual bulletin will tell you more about the simple, versatile Moyno Pump. Write for your free copy of Bulletin PE-103.

ROBBINS & MYERS, INC.

SPRINGFIELD 99, OHIO • BRANTFORD, ONTARIO

Fractional & Integral h.p. Motors & Generators

Electric Fans

Electric & Hand Hoists & Cranes

Moyno Pumps

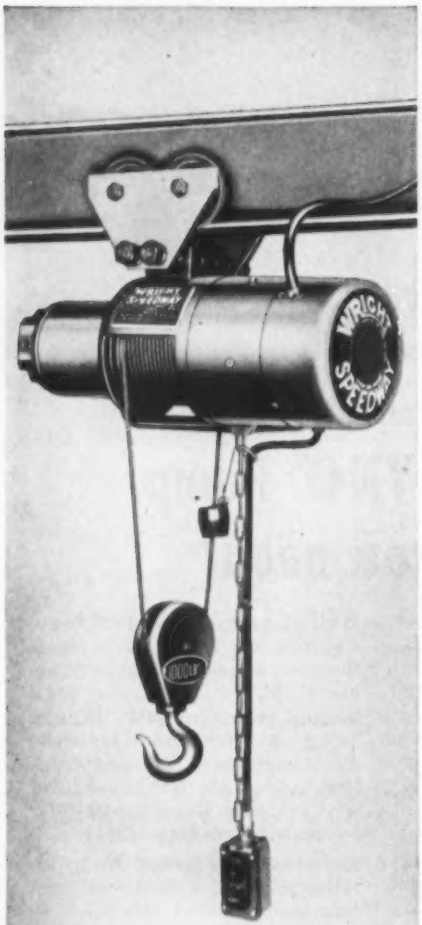
Propellair Industrial Ventilating Equipment

For more facts circle 533 on Reply Card

ACCO products

Wright Speedway Hoists

Why WRIGHT Speedway Hoists Last Longer . . .



• 5 key features of WRIGHT *Speedway* Hoists mean longer life and less servicing. These features are heat-treated and surface-hardened alloy steel gears, hard alloy silver electrical contacts in controller, heavy duty crane type safety limit stop, automatic multiple disc load brake and ball bearing gear shafts.

And there are other features which add further to the fine service you get from a WRIGHT *Speedway* Hoist. For instance—grooved cable drum, improved plow steel preformed cable, concealed motor wiring, and completely enclosed, ventilated housing weatherproofed for permanent outside use. Ball and roller bearings seldom require additional lubricant. Gear train is sealed in oil bath chamber.

You can get standard lift, long lift, or close headroom WRIGHT *Speedway* Hoists in capacities from ¼ to 10 tons—all with these same quality features. See your local WRIGHT distributor or write our York office for **DH-133-A.** WRIGHT will save you money.

ACCO

WRIGHT HOIST DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

York, Pa., Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

WRIGHT
Hoists
Trolleys
Cranes

For more facts circle 534 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

plate, the regular steel plate replacements would have cost $1,680. Therefore, allowing for the cost of the rubber lined plate, the installation gave a net saving of $1,585 for this one elbow in a little over two years time. *From Gates Industrial News, published by the Gates Rubber Co., Denver, Colorado.*

Palm-Sized Fire Detector

Consisting of small cells, each containing a radioactive element which sensitizes the interior of the cell to a trace of smoke, this new fire detector fits into the palm of the hand. Each cell will protect from 20 to 50 yards of floor space. It is now in use by the British Admiralty. (From British Information Services, New York, N. Y.)

Checking Bearing Wear

THE MOST COMMON of all causes of bearing failure is dirt. Bearings which fail because of dirt can be recognized in several ways.

Generally, fine dirt in a bearing acts as an abrasive and causes lapping of the bearing parts. This can be seen and felt in the ball or roller paths of the self-aligning type bearing. These paths will be polished as will the balls and rollers.

If there are no breaks in the surfaces of the rolling elements and the ball or roller path is clearly defined, fine dirt was present in service.

Bearings of the deep-groove type are not as easily examined since the ball paths and the balls cannot be readily seen. A preliminary check can be made by feeling the amount of clearance between the inner and outer races. This can be done by laying the bearing on a flat surface and holding one ring stationary. If the other ring can be moved in a position parallel to the surface, wear has taken place.

Do not attempt to feel wear in a bearing when holding it in your

hands. In this position, it is possible to feel the normal internal clearance which might be mistaken for wear.

If examination of a bearing indicates that wear has taken place, the actual application should be carefully checked. You may find a quantity of hard, gritty particles, such as produced by a grinding wheel or a buffing stand.

Seals should be checked thoroughly to make sure that dirt is not going to pass the seals and into the bearing.

The lubricant should be checked as well as the method of lubricating the bearings. Slipshod maintenance methods could be the reason for dirt getting into the lubricant and then passed on into the bearing.

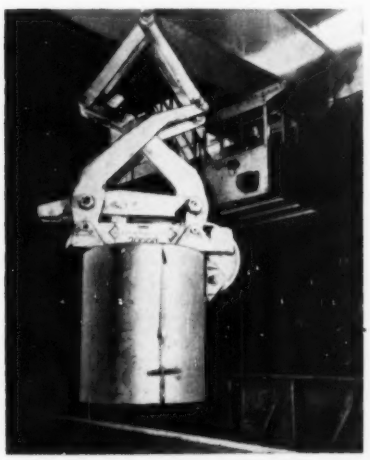
Sometimes a simple, inexpensive shroud or sheet metal box can be used to deflect dirt away from the bearing housing. *From the AFBDA Bearing Maintenance Report, published by the Anti-Friction Bearing Distributors Association, Cleveland, Ohio.*

No Ground Help Needed To Move Heavy Loads Through Air

FIFTEEN-TON coils, containing enough sheet steel for 15 automobiles, 150 refrigerators, or 180 washing machines, are lifted from the shipping platform and loaded in freight cars "as easy as one, two three" in the Pittsburgh Steel Co's new hot rolled sheet mill at Allenport, Pa.

Suspended from an overhead crane, tongs are lowered over the vertical coil, grasp it firmly, and carry it quickly and safely to its destination. When the coil again rests on a firm surface, the tongs are lowered slightly, causing their jaws to lock open, and are then ready to pick up another coil.

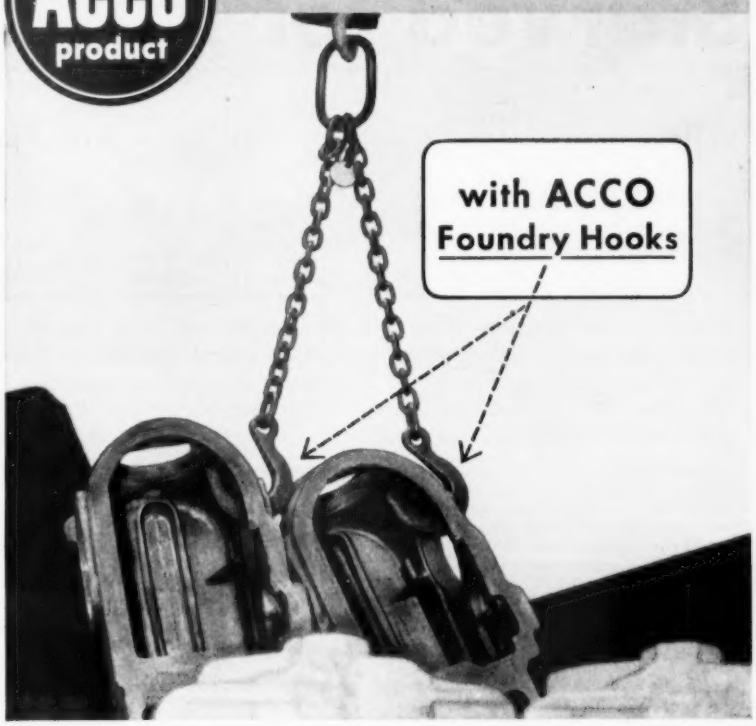
All operations are controlled by the craneman. There is no need for



Automatic tongs, controlled by craneman, help hoist heavy coil of steel from shipping platform to freight car

an ACCO product

ENDWELDUR SLING CHAINS



How You Can Speed Up Handling of Castings

• Castings frequently are odd shaped and hard to hitch to with regular sling hooks. So AMERICAN developed the series 500 ACCO Foundry Hook with rounded point and wide mouth that can be hooked to a wide variety of lifts.

These hooks are drop forged of the same material as the chain. They are built into ACCO *Registered* Endweldur Sling Chains at the factory and the complete assembly is proof-tested from bearing to bearing.

ACCO Foundry Hooks are safer than home-made hooks. And they're cheaper because you save the cost of fabricating and assembling to the chain in your plant. The completed unit bears the well-known ACCO *Registered* identification ring—your assurance of highest sling chain quality.

See your AMERICAN CHAIN distributor or write our York, Pa., office for DH-130

ACCO

AMERICAN CHAIN DIVISION
AMERICAN CHAIN & CABLE

York, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Bridgeport, Conn.

American Chain

For more facts circle 535 on Reply Card

Is Your Factory Starved for AIR?

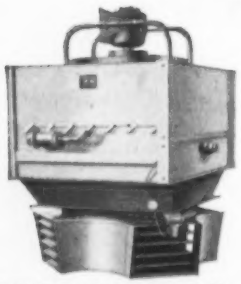
If this is what happens when you go from the office out into the shop, your plant is starved for air! The vacuum created by the operation of necessary exhaust equipment is usually responsible. While our pictures may be slightly overdrawn, something like that may be happening in your plant.

If your building is not new, the vacuum may be relieved by crevices, loose-fitting doors, windows, and open doors which will admit so much unheated air that a great deal of discomfort may be caused and your present heating system will be entirely inadequate.

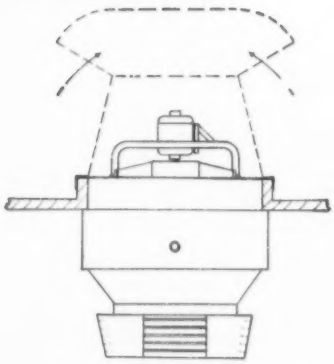
If the building is tight—no excess crackage and no frequently opening doors—the ventilating system which you so painstakingly designed and installed to protect your employees and increase production won't work properly, unless you make special provisions for delivering into the building an amount of warmed air at least equivalent to that which your exhaust system will take out.

There is an easy solution. Install WING FRESH AIR SUPPLY HEATERS with Revolving Discharge Outlets. In winter they bring in fresh air through heating coils varied to just the right temperature, replacing exhausted air. In summer, with the steam turned off, they circulate the air in your plant, giving a cool, refreshing sensation to the workers and keeping production up to normal in stifling weather.

WING FRESH AIR SUPPLY HEATERS



WING Fresh Air Supply Unit with fan enclosed in casing.



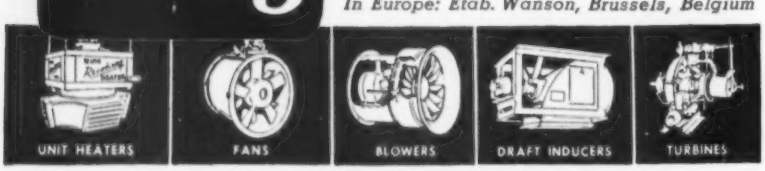
(Right) WING Fresh Air Supply Unit with fan above roof line.

Write for Bulletin HVT-1 and learn the facts about fresh air make-up for your plant.

L.J. Wing Mfg. Co. Linden, N.J.
177 Vreeland Mills Road

Factories: Linden, N.J. & Montreal, Canada
In Europe: Etab. Wanson, Brussels, Belgium

Wing



For more facts circle 536 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

a ground crew to fasten or unfasten the burden. The tongs will not malform the coils nor mar the edges of the sheet steel. *From a release for Heppenstall Co., Pittsburgh, Pa.*

Small Plant Methods Study

"WHY," you may ask, "is it important for me, a small plant operator, to analyze, standardize, and measure my operations, and then give my workers some sort of incentive pay?"

The answer lies, to an important degree, in your profit and loss statement. It lies also in the kind of shop you run. Almost inevitably, intelligent application of the methods engineering procedure will result in higher production, lower costs and better morale.

For example, a small manufacturer asked a management consulting firm to look into his plant layout problem. After analyzing the plant, the management consultants and the manufacturer concluded that layout was not the basic problem, but that significant savings could be made by a simple methods study on one of the manufacturer's products.

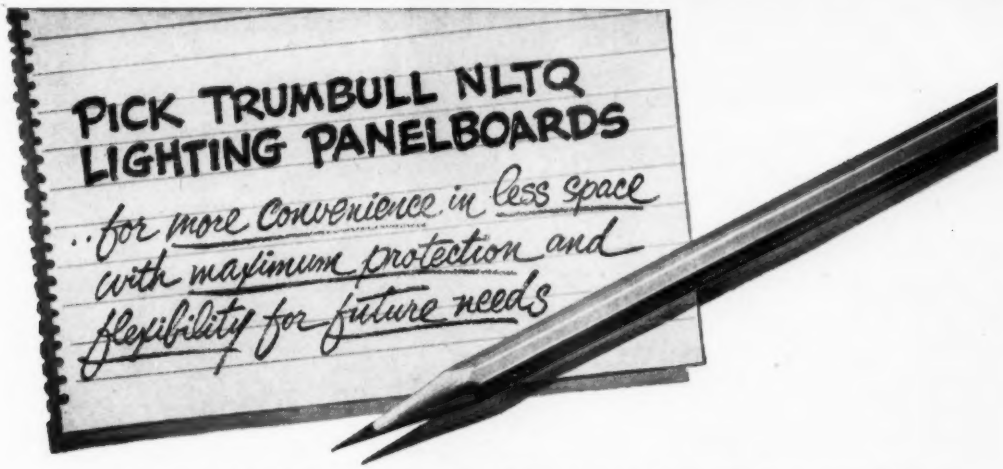
Production of this particular item was completely independent of the other activities in the plant. Actually, it was a single-employee "plant-within-a-plant," where one man performed all 18 operations on the product.

A methods engineering study was agreed upon and conducted. It resulted in a total cost to the company of about $600. It also resulted in a 78 per cent increase in production; a 10 per cent decrease in material costs; a distinct improvement in the appearance of the product; and an annual saving of $1800.

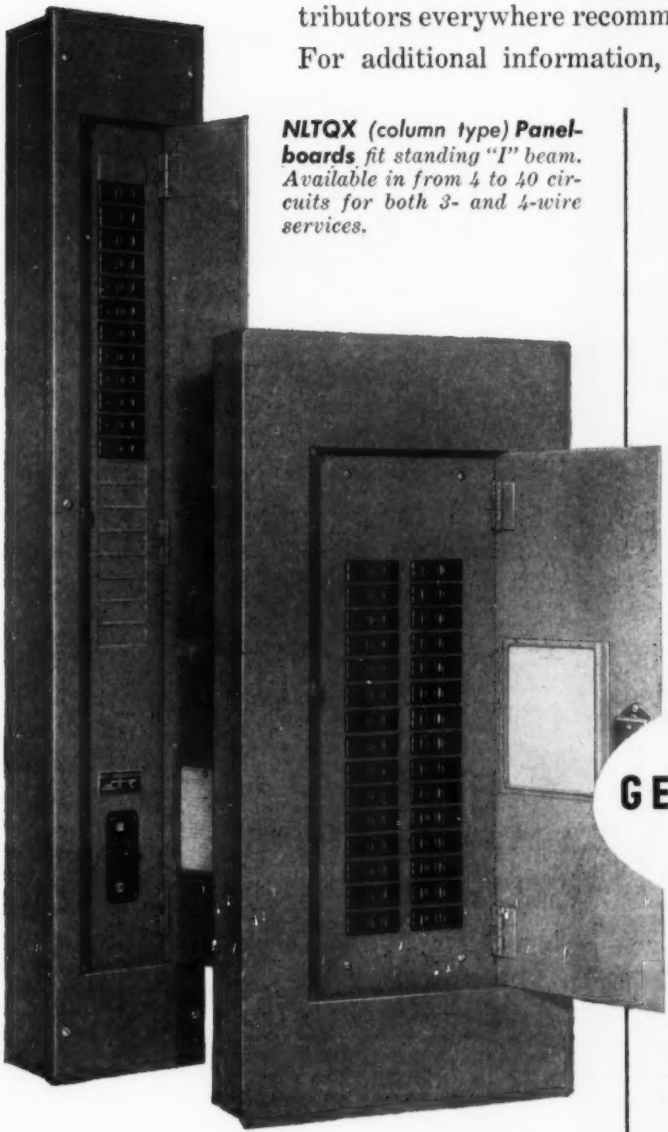
If the company had had on its staff a person trained in methods work, it could have accomplished the same results independently.

Besides reducing costs, there are other benefits which you can gain from methods engineering. The use of proper pay scales tends to build a better satisfied team of employees.

Furthermore, the measurement phase of methods engineering will enable you to have better control of your manufacturing operations. It affords proof of whether or not the company gets what it pays for by providing reliable figures on how much production is turned out per unit time, and what the company paid its workers to get that production. *From Management Aids for Small Business, published by Small Defense Plants Administration, Washington, D.C.*



Trumbull's fifty-year leadership in panelboards has never been more in evidence than in its NLTQ line. Leading electrical distributors everywhere recommend them and carry complete stocks. For additional information, let us mail you Bulletin TEB-14.



***NLTQX** (column type) **Panelboards** fit standing "I" beam. Available in from 4 to 40 circuits for both 3- and 4-wire services.*

3 WAYS BETTER...

1. Circuit breaker convenience and protection. Type TQL. Quick-make, quick-break. Thermal-magnetic trip, arc-quenching design and trip-free action for top protection. Convenient plug-in design and manual re-set. Equally important, it has a separate trip indicating position.

2. Strong compact interiors readily removable for fast installation. Busbars molded in plastisol, and braced against damage from current surges. Run cooler than in open air.

3. Compact boxes, protected fronts. Adequate knockouts and gutters. Front integral with barrier. Breaker knockouts in front panel to provide for future circuits.

GENERAL ELECTRIC

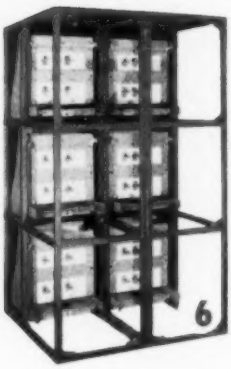
DISTRIBUTION ASSEMBLIES DEPARTMENT
PLAINVILLE, CONN.

***NLTQ Panelboards** available in from 4 to 42 circuits for both 3-wire and 4-wire services with lugs only or Trumbull 50 to 225 ampere breakers in the mains, and TQL 120 volt, 10 to 50 ampere circuit breakers on branches. AC only. Underwriters' Laboratories, Inc. listed.*

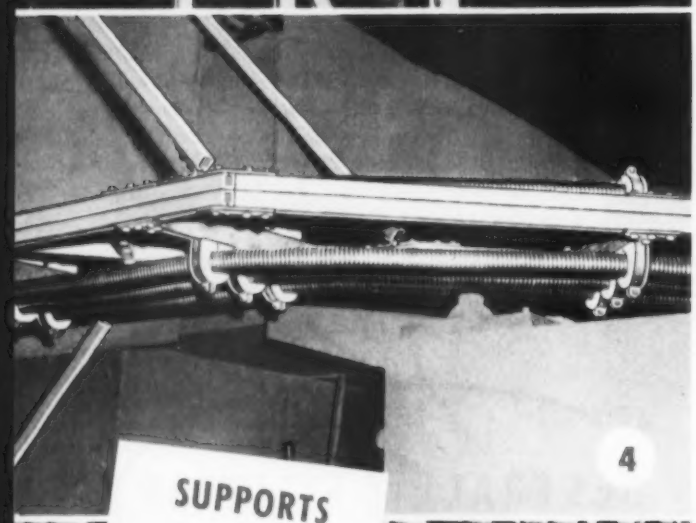
For more facts circle 537 on Reply Card

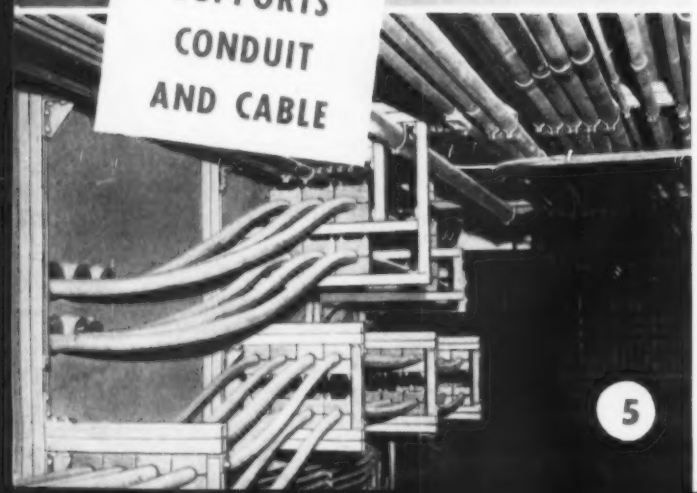
USE ADJUSTABLE UNISTRUT® METAL FRAMING TO MOUNT, FRAME, SUSPEND, SUPPORT ALL YOUR ELECTRICAL EQUIPMENT

quickly, easily, at low cost— right on the job!



- **No welding, drilling, or punching**
- **Fast on-the-job assembly**
- **Reduces engineering detailing**
- **Eliminates errors**
- **Last minute changes easily made**
- **No waste—UNISTRUT is re-usable**

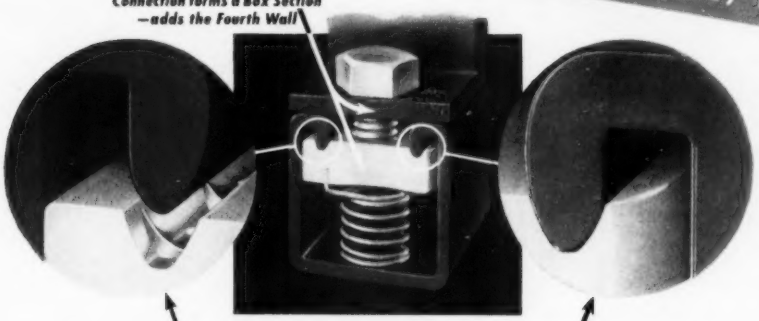




1. Showing portion of processing plant's motor control rooms with all control equipment supported by UNISTRUT channel, maple cable clamps and fittings.
2. UNISTRUT-supported fluorescent fixtures in machine shop. System provides perfect fixture alignment, added safety and better appearance.
3. UNISTRUT-supported heavy conduit run in large processing plant. UNISTRUT's extreme flexibility permits later additions or changes.
4. Bracing arrangement utilizes standard UNISTRUT channel and fittings in attaching the cable-supporting UNISTRUT framework to wall. Note porcelain insulating clamps.
5. UNISTRUT framing, porcelain and maple insulating cable clamps support cable and conduit.
6. Section of a draw-out switch cubicle completely framed with UNISTRUT channel and fittings.

This is UNISTRUT
the complete framing system

Connection forms a Box Section —adds the Fourth Wall



Hardened Nut has Corrugated Grooves which bite into Inturned Edges for Positive Clamping Action

Inturned Edges can't Buckle or Spread. Nut-to-Channel Locking Action holds Side Walls in Original Position

This Pyramid Shaped Edge has ⅓ more Bearing Surface than ordinary Flat-Edged Channel and Flat-Surfaced Nut

ONLY THE UNISTRUT FRAMING SYSTEM HAS THIS POSITIVE CLAMPING ACTION AT ALL POINTS OF CONNECTION!

Distributors and Warehouse Stocks in Principal Cities. Consult your Telephone Directories.

Write for NEW Free 84-page Pocket Catalog No. 800!

For the Man on the Job—packed with photos, drawings, ideas and data on how to frame, mount, rack and support electrical and mechanical equipment with UNISTRUT metal framing.

UNISTRUT Products are Bonderized

U. S. Patent Numbers
2327587 2329815 2345650
2363382 2380379 2405631
2541908 Other Patents Pending

See our complete Catalog in Sweet's 1953 Plant Engineering, Industrial Construction, and Architectural Files.

UNISTRUT

The World's Most Flexible All-Purpose Metal Framing

UNISTRUT PRODUCTS COMPANY
1013 W. Washington Blvd., Chicago 7, Ill., Dept G10

Please send me a copy of the new Catalog 800, without obligation.

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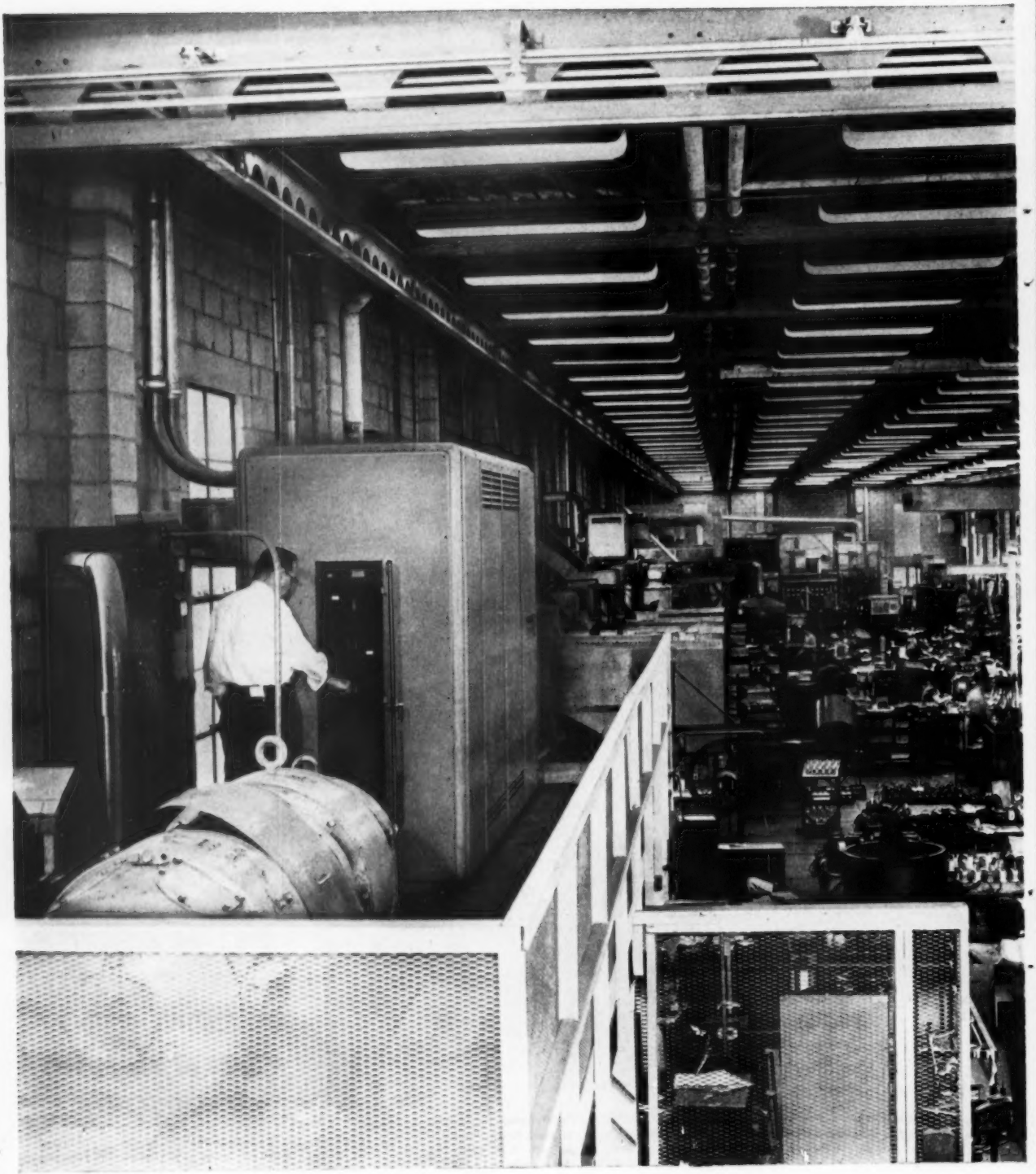
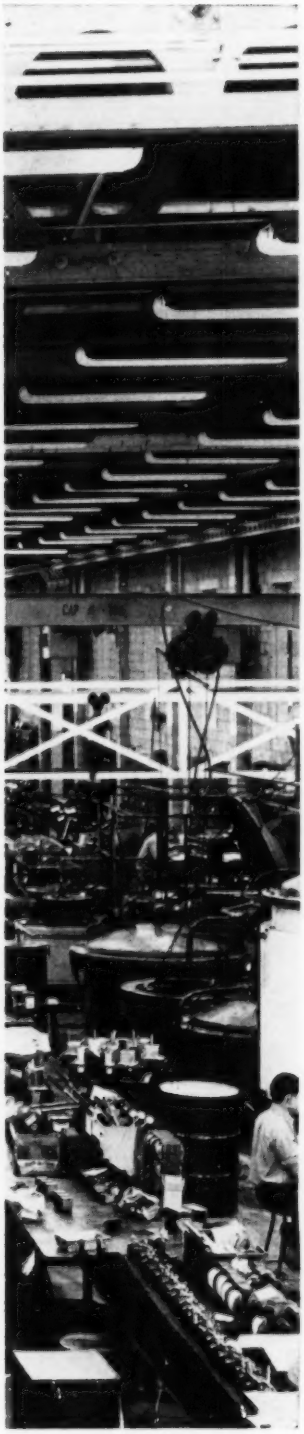
City_____ Zone_____ State_____





Here's how Westinghouse power centers increase plant output...safely

Safe, efficient power distribution that actually helps increase plant output... that's what this Western Pennsylvania manufacturer realized by installing modern Westinghouse dry-type power centers.

Dry-type power centers minimize installation costs because they are completely safe. Since they are *both* fire and explosion resistant, they can be located right in the production area. They require no vaults, catch basins, toxic gas vents, or drains. Lightweight, they can be installed overhead, releasing valuable floor space for production. This makes it easier to locate them close to the load they serve, shortening secondaries, cutting line losses, improving regulation. The result: Increased production efficiency.

In the plant pictured at the left, two Westinghouse power centers divide the load. Capacity is provided in each to allow for expansion.

Add these up for your plant: (1) Safe, economical installations. (2) Increased production space. (3) Increased plant efficiency through improved regulation. (4) Savings in power cost through reduced losses. (5) Savings in heavy copper through shortened secondaries.

Westinghouse power centers can bring these advantages to your plant, too. Because they are factory assembled and coordinated as one unit, with components designed to meet your individual requirements, they can be installed quickly and easily. For further information, check with your contractor, your Westinghouse distributor or local representative, or write direct to Westinghouse Electric Corp., P.O. Box 868, Pittsburgh 30, Pa.

J-70708

YOU CAN BE SURE...IF IT'S Westinghouse

For more facts circle 539 on Reply Card

OPERATION AND PRODUCTION pointers for the industrial plant engineer

Edited by H. E. B. Anderson

Wire Terminals Applied by Machine

Contributed by Carl H. Judisch
Plant Engineer, Whitney Blake Co.

THE PRODUCTION RATE for both straight and coiled telephone cords has been increased significantly, with an accompanying improvement in quality, on our production line. Introduction of Aircraft-Marine Products' automatic wire terminators has proven the key to the changes.

In terminating a two-conductor cord with hard-to-handle tinsel conductor by the formerly used method (loose piece terminal method) the rate was 400 terminations per hour. With the adoption of machine-applied, strip-fed terminals, the rate rose to 870 per hour, an increase of 117 per cent. In processing a three-conductor cord, the rate of terminal application under the old method fell, while the rate under the new method rose. The new method rate, rising to 1020 terminations per hour, represented an increase of 183 per cent. Similarly, the rate on four-conductor cables rose 281 per cent.

Automatic terminating machine in operation. Reel at upper right holds strip of terminals for automatic feed

The uniformity of the new-type terminals has also made it possible to reduce sampling for resistance variation tests conducted on the terminals.

A broad range of dies and terminal types that can be used in the new machines, together with the ease of changing these dies in the press, facilitates processing of a variety of terminations on both Telecord and Koiled Kord telephone cord sets. Individually mounted on portable stands, the machines can be quickly shifted to different positions on the assembly line as production requirements change.

Die Inserts Minimize Fabrication

INTERCHANGEABLE INSERTS for one master block, replacing several individual clamp blocks in a tube end forming machine, have instigated considerable savings at Temco Aircraft Corp., Dallas, Texas.

As fabricated in the plant's tool and die shop, the master block duplicates a standard clamp block in all external dimensions except length. An additional ½ in. of stock has been left on the block, and machined to form a rim or shoulder against which the inserts are butted

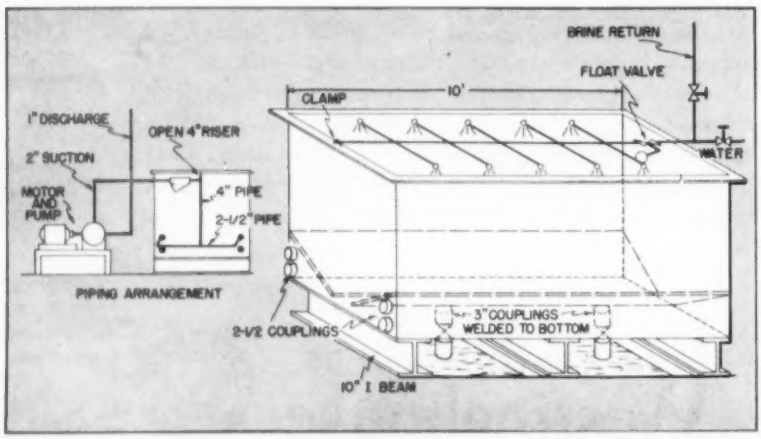
Construction of a Mixing Tank for Recirculating Brine in Refrigeration System

Contributed by H. Nye Josleyn

MAKING STRONG clean brine for refrigeration or other plant purposes is simplified, if done in a properly constructed tank. The sketch shows a mixing tank that handles up to 10 tons of any grade or size rock salt per day. This tank was designed for maintaining up to 100 deg salometer brine in a recirculating system where return brine to the tank averages 55 deg salometer and 12 F.

The tank itself is 4 by 4 by 10 ft inside, all welded, constructed of black iron plate. The bed-bottom plates angle down to make an open trough 4 in. wide, 4 in. from the bottom of the tank. Three-inch gate valves control two drain connections welded into the tank bottom.

Four 2½-in. couplings are welded into each end of the tank. The upper couplings serve as brine outlets to the pump, through a 4-in. open-top riser; the lower couplings are for clean-out. The brine filters from the top of the tank through the rock salt and silt bed, down to the upper outlets. During clean-outs, water is flushed through the lower couplings, to rinse the heavy residue through the drain valves in the bottom.



Sketch of tank shows constructed detail. Piping diagram of pump lines is at left

Suction of the self-priming 35 gpm centrifugal pump is through 2½-in. pipe, teed from the 4-in. riser at a height to maintain the liquid level about 4 in. below the top of the tank. The pump discharges brine to locations as needed: to a larger tank for cooling, direct to unit coolers, to water softeners, or to other plant locations.

Spray headers on top of the tank, fed by the return of makeup lines, provide an even distribution of the liquid over the salt bed. A 5-in. float, operating a butterfly valve in the line, controls return line.

Salt is loaded from the floor above, through a manhole. Hopper loading will increase the handling efficiency of the rock salt. To insure clean brine, salt level in tank should be kept at least a foot above trough bottom.

Personnel Protection

ALLIS-CHALMERS

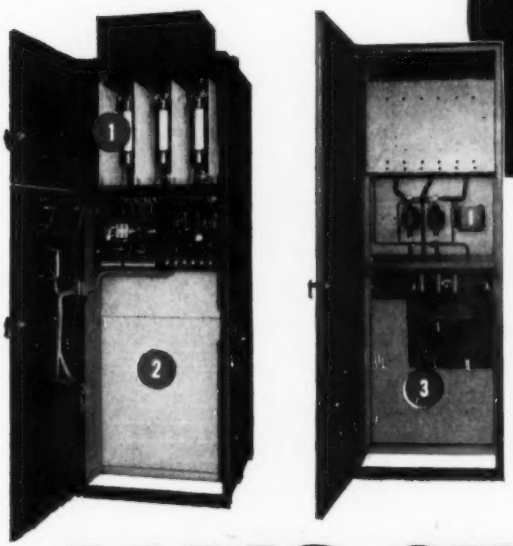
Type H Starters

FOR 2300 TO 5000 VOLT MOTORS

THROUGH SEGREGATED HIGH VOLTAGE COMPARTMENTS

For positive personnel protection, high voltages are completely segregated in the Allis-Chalmers Type H starter. Full width, heavy sheet steel barriers separate the front low voltage compartment from the rear high voltage equipment and from the upper fuse compartment. It will pay you to get all the details from your nearby A-C representative or by writing Allis-Chalmers, Milwaukee 1, Wisconsin.

Current limiting fuses are easily removed with hook stick. Safety door interlocks take motor off line when fuse compartment door is opened.



3 Compartments Assure Safety

The heavy gauge steel cubicle is divided into three compartments for maximum safety. **1** — Upper front compartment encloses disconnect type fuse. The same operation which puts fuse in position for removal isolates starter from line. **2** — Lower front compartment houses low voltage control devices. **3** — Rear compartment contains high voltage equipment, contactors, buses, instruments, transformers, etc.

A-4002

ALLIS-CHALMERS

A-C ALLIS CHALMERS

For more facts circle 540 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 54)

Operator holds upper half of adjustable die. Lower half is in position on press

when placed in the block. The inserts themselves are semi-circular sections held in the master block with two set screws.

Savings resulting from the master block-insert combination increase with the number of tube sizes being processed. The first set, consisting of one master block and nine inserts designed for tube sizes from ½ in. to 2 in., saved an estimated 315 man-hours in fabrication time alone.

Pump Gaskets Are Important

GASKETS ARE USED in pump casing assemblies to effect a tight seal between the casing parts. In split case pumps, the casing gasket must seal against leaks not only to the outside of the pump but also to leaks between adjacent internal parts of the pump. Leaks along gasketed surfaces inside the pump have been the cause of many pump casualties resulting in costly repairs.

Interior leaks behind casing wearing rings and along interstage and breakdown bushings can be prevented through the use of the correct gasket material and by fitting the gasket properly.

Proper procedures for cutting and fitting pump gaskets, as suggested by the U. S. Navy Bureau of Ships, are:

1. Make sure that the surface to be gasketed is clean and the edges of the joint are not ragged.
2. Smooth out the gasket material, and trim excess material around the outside of the casing.
3. Locate the dowel pin holes in the casing by rubbing a smooth block of wood or butt end of a hammer handle over the gasket. Cut holes for the dowel pins, then anchor the gaskets securely with the dowel pins. Any sloppiness of fit here will probably result in all imperfect fits of the gasket. If a slip is made, discard the gasket and start another.
4. Locate edges of the volutes in the same way the dowel holes were located. Do not rub over machined edges, such as wearing ring lands and stuffing boxes.
5. Use a sharp knife and carefully cut along the cored edges, starting with the volutes. When approaching machined edges, swing the cut-out to leave about ¼ inch of material along the side of the cored edge. Move straight across the pump to the opposite side, cutting as above. This will leave strips across each machined section of the casing. These strips help to hold the gasket in place and prevent wrinkling.
6. Start cutting at the machined edges. Care must be taken at this point to avoid any shifting of the gasket. Leave the material across the stuffing boxes until last—this keeps the gasket in one piece while the work around the bushing and wearing ring bores is completed.
7. Separate the gasket into two pieces by cutting at the stuffing boxes. When making this cut, leave about ⅛ inch of material projecting over the edge into the stuffing box. This insures against leaving any passage for liquid to go past the outside of the packing.
8. After the rotating element is seated in the lower half of the casing and the wearing rings are adjusted, apply a thin film of grease or other suitable light adhesive on the lower half of the joint and lay the gasket. Press the gasket to the surface firmly enough for the adhesive to hold it, then lower the top half of the casing in place.
9. When bolting the casing together, tighten the nuts or bolts nearest the bore and at the center of the pump first. Tighten on one side, then the other, progressing outward and towards the ends.

Don't use a hammer to cut pump gaskets. Hammering out a gasket may seem the easier method, but it is also the more destructive, resulting in frayed, poorly fitted gaskets and damaged casings.

Test Probe Reaches High Sockets

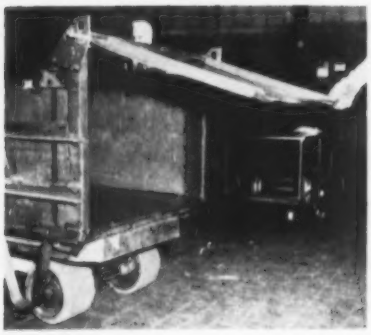
Contributed by George Ordaneff Allis-Chalmers Manufacturing Co.

IN THE GENERAL PRACTICE of inspecting electrical circuits, the surest check is the operation of the devices concerned. In cases of items such as lamp sockets or power sockets, this check can be made by energizing the circuit and measuring voltage obtained at these tap-off points.

Since checking is normally performed on equipment completed for shipment, inaccessible sockets in upper portions of units require the use of ladders or platforms to reach them. In the Allis-Chalmers electrical test department, an extension

(Continued on page 57)

Scrap Box Features Tail Gate



Steel scrap box at Art Metal Construction Co., Jamestown, N. Y. Rod at top of end panel rides in body slots; pins on bottom fit into holes along bottom. Gate swings up and out for dumping

Triple-Length Conveyor

Combining three separately powered 20-ft Brik-Toter conveyor sections, contractor used full length to lift masonry materials to 35-ft high roof. Saving of 65 per cent was made in handling costs

"Bottoms Up" Scrap Cart

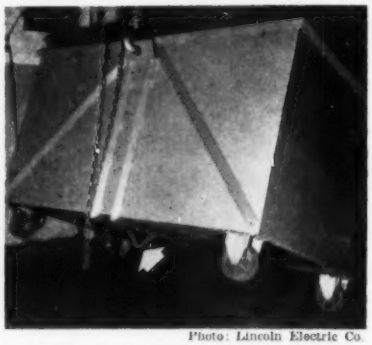


Photo: Lincoln Electric Co.

Flat bar, bent in V shape and welded to chip cart bottom (arrow) provides means for crane hook to invert cart to dump tangled chips at Premium Die & Tool Corp., Jamestown, New York

MODEL 450 REMINGTON STUD DRIVER

Simplifies construction fastening in new medical center

Contractors use ten Stud Drivers for fastening in steel and concrete

Contractors for University of Minnesota's new Mayo Memorial Medical Center gave the Remington Stud Driver a real workout. They used 10 of these powerful tools to install ventilating ductwork and to anchor 2,500 metal door bucks to concrete. Door bucks were set separately, walls finished later. This meant plenty of open space for moving in equipment and other material.

For fastening 900 window frames, Remington Stud Drivers again proved fast and convenient. Workmen found the rugged 5½-lb. tools easy to handle, simple to operate. They liked the fact that there were no wires or hose to get in the way as they worked from frame to frame. And every stud was driven arrow-straight—thanks to the precision power supplied by 32 caliber cartridges.

Can the Stud Driver help you?

Your local distributor will be glad to show you the Remington Stud Driver in action—on concrete, brick or steel. Find out how *you* can cut construction costs and speed fastening jobs. For the name of the distributor nearest you and for full information about this modern fastening system, send in the coupon below.

MAIL THIS COUPON TODAY

Industrial Sales Division, Dept. PE-10
Remington Arms Company, Inc.
939 Barnum Ave., Bridgeport 2, Connecticut

Please send me *free* copies of the new booklets showing how I can cut my fastening costs — and the name of the distributor nearest me.

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Remington DUPONT

Listed & Approved by Underwriters' Laboratories, Inc.

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P&H OVERHEAD CRANES

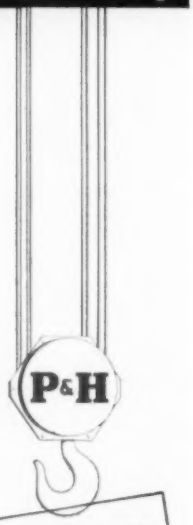
Why P&H builds the entire Crane

. . . including electrical equipment!

If you want the utmost in service from your cranes, insist that they be job *engineered* by P&H — not an assembly of components from various sources. For example, general purpose electric motors don't stand the gaff of crane service like those *designed* for the job. That's why P&H builds its own motors, brakes and controls — with all characteristics *properly suited* to crane operation: P&H electrical equipment throughout is your assurance that all functions are perfectly coordinated. It means better service, less maintenance.

This policy of complete quality control — of single manufacturing responsibility — better service — made P&H the leading builder of overhead traveling cranes. Continuous improvement, far ahead of the field, has extended this leadership. Benefit by it when you buy your next cranes.

*T.M. of Harnischfeger Corporation for electromagnetic type brake.



P&H MAGNETORQUE* AC Crane Control is the most important development in crane service in 25 years.

P&H OVERHEAD CRANE DIVISION

HARNISCHFEGER CORPORATION

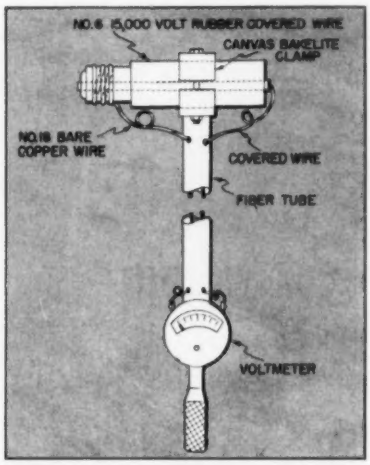
Milwaukee 46, Wisconsin

the P&H Line

For more facts circle 542 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 52)



Lamp and power socket testing probe for checking high spots on equipment

device has been developed, with probes to contact the center post and outside ring of lamp receptacles.

A voltmeter is connected at the lower end of the probe, for measuring the voltages in the sockets being tested. Using this probe, testing of hard-to-reach sockets can be done quickly and safely, without clambering over the equipment or spending a great deal of time climbing ladders.

Remote Control for Conveyor

Contributed by Howard T. Bailey
Brillion Iron Works, Inc.

ON A VERTICAL TYPE core baking oven in our plant, with an overall height of 60 ft., it has been necessary to climb to the top of the oven each time that a speed adjustment was required.

Driven through a Reeves adjustable speed drive located on top of the oven, the conveyor speed was changed with the type of cores being baked. The climb involved each time the change was made was both tiresome and dangerous.

Installing two Selsyn motors eliminated the climb and considerably

Chart Presents Factors for Fluid Flow at Constant Head

Contributed by John D. Constance

WHEN DEALING WITH LIQUIDS in turbulent flow, with normal viscosities in the range of water, the accompanying chart is useful for determining the effects of pipe size changes on flow rates.

If pipe terminal conditions and length of pipe run remain the same, the factors will permit rapid calculation of flow through another pipe size. It may be used for steam and gas flow for low pressure drops where the effect of density changes with pressure drop is not great, but under other conditions of flow, it should be used as a guide only.

The factors were calculated from the formula:

$$\text{Flow factor} = \left(\frac{\text{Given flow size (in.)}}{\text{New flow size (in.)}}\right)^{2.5}$$

Example: Flow through a 4-in. pipe is 100 gpm. Find the flow through a 2-in. pipe under constant head conditions. From the chart, the factor is 0.177. Therefore, flow through 2-in. pipe is 100 x 0.177 or 17.7 gpm.

FLOW FACTORS AT CONSTANT HEAD

GIVEN FLOW SIZE	NEW FLOW SIZE								
	1	1½	2	3	4	6	8	10	12
1	1.0	2.76	5.65	157	32	88	180	318	500
1½	0.364	1.0	2.04	5.65	11.6	32	66	115	182
2	0.177	0.487	1.0	2.76	5.65	15.7	32	56	88
3	0.064	0.177	0.364	1.0	2.04	5.65	11.6	203	32
4	0.031	0.087	0.177	0.487	1.0	2.76	5.65	9.9	15.7
6	0.0115	0.031	0.064	0.177	0.364	1.0	2.04	36	5.65
8	0.0055	0.0152	0.031	0.087	0.177	0.487	1.0	1.75	2.76
10	0.0032	0.0087	0.018	0.05	0.101	0.28	0.572	1.0	1.58
12	0.002	0.0055	0.0115	0.031	0.064	0.177	0.364	0.635	1.0

Chart of factors for predicting constant-head fluid flow through various pipe sizes

P&H ELECTRIC HOISTS

A real wire rope hoist!

Of course you prefer the Zip-Lift! With all its quality features, who wouldn't! But if higher cost has stopped you, here's good news. It is now available with improved rope control (one pendant, *not two*), for simple, easy, trouble-free operation — for only $199.50. It is the same Zip-Lift in other respects — same quality — new type control. *What a buy!*

Call your Zip-Lift Dealer
Or write us for Bulletin H-29

Available also with full electric push-button control.

Other models up to 15-tons capacity

P&H ELECTRIC HOIST DIVISION
HARNISCHFEGER CORPORATION
Milwaukee 46, Wis.

For more facts circle 543 on Reply Card

Where you must have the Safety of a Burst-Proof Hose and the extreme flexibility that only Republic WIRETEX can give . . . a hose that will **safely** carry super-heated steam up to 388° F. . . . then WIRETEX Steam Hose will meet your specifications —

and with more to spare

Republic WIRETEX is built in 60-foot **Economy Lengths.** With WIRETEX, you save money when you buy; time and money when you use it! Get the facts today! Other Republic WIRETEX Hoses are available in all standard (3/8" to 2") sizes for handling Air, Steam, Hydraulic Fluids, Greases and other Petroleum Products.

Your local Republic Distributor can help you plan, select, apply and maintain any Product of Industrial Rubber. If he is not listed in the yellow section of your telephone directory, write us for his name and address.

REPUBLIC RUBBER DIVISION

LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN 1, OHIO

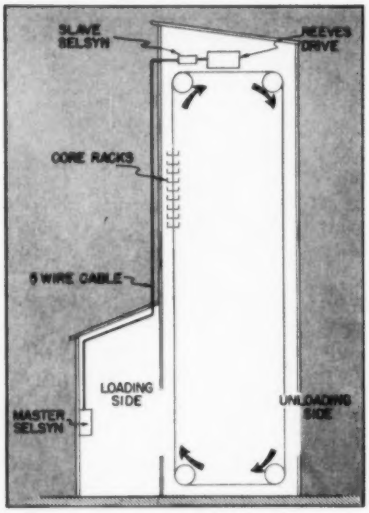
INDUSTRIAL RUBBER PRODUCTS

EXTRUDED AND MOLDED PRODUCTS HOSE PACKING BELTING

For more facts circle 544 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 52)



Elevation of core baking oven shows relative positions of Selsyns and drive

eased the process of speed changing on the conveyor.

One Selsyn was coupled direct to the drive control shaft on top of the oven; the other was installed at a convenient location near the oven tender's station. The Selsyns were connected through a 5-wire cable.

To change conveyor speed, the oven tender now merely rotates the lower Selsyn control to the desired setting and the slave Selsyn regulates the speed control mechanism on the top of the oven.

"Two-Shot" Forming Operation

IN THEIR ALUMINUM fabricating plant, an over-press plate is netting Temco Aircraft Corp., Dallas, more than $5,000 annual saving by making hand-finishing an unnecessary aftermath to hydropressing.

Designed by hydropress leadman

Over-press plates are placed over formed parts prior to second hydropressing

Complete protection for ESSENTIAL DRIVES

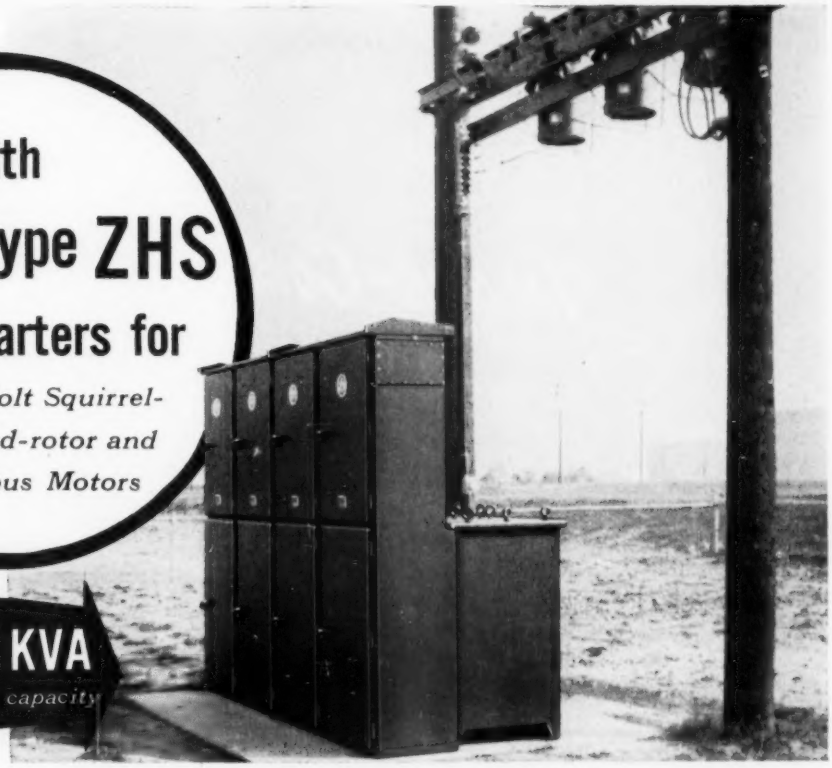
with

EC&M type ZHS

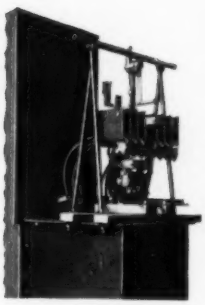
motor starters for

2300 - 5000 Volt Squirrel-cage, Wound-rotor and Synchronous Motors

50,000 KVA
interrupting capacity



Four EC&M High Voltage Starters, outdoor mounted in Sun Oil Company's Sun Station Terminal at Nederland, Texas, provide push button remote starting and full protection for the motor-pump drives.



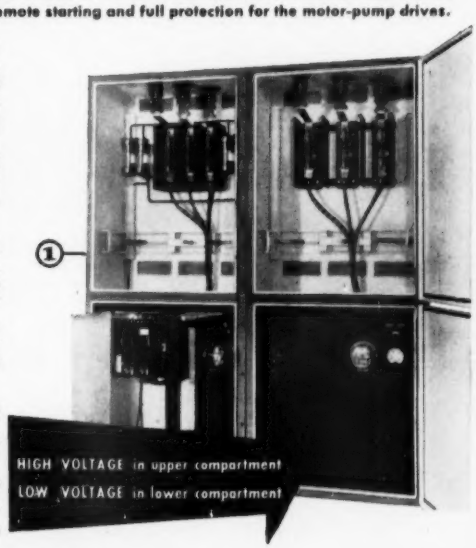
Contactor-lifting mechanism raises ZHS Contactor for easy inspection or contact renewal. No bolts or wires need be removed for this operation.

For important "main-line" drives, EC&M Type ZHS Starters give complete protection these four ways: 1) SHORT CIRCUIT Protection, 2) MOTOR Protection, 3) LOW VOLTAGE Protection, 4) PERSONNEL Protection.

Enclosures available for all requirements. Indoor or outdoor mounting—Type VIII Construction for Class I, Group D Hazardous Locations and Type IA for dusty atmospheres.

When making initial cost estimates, get the facts on EC&M High Voltage Starters. Our nearby office will be glad to supply full information on starters which give complete protection.

Write for Bulletins 1062 & T9-117



(1) Provision for future mounting of VALIMITOR (volt-ampere-limiter) coils for unlimited protection—bus KVA capability may be infinite.

THE ELECTRIC CONTROLLER & MFG. CO.
2698 EAST 79TH STREET ★ CLEVELAND 4, OHIO

For more facts circle 545 on Reply Card

ORTON
Torque-Control*
POWER CONTROL
WEAR CONTROL
• NO JERKING, slip-clutching or racing engines!
• CUSHIONED SHOCK— only the exact amount of power needed to move the load!
ORTON
ORTON CRANE AND SHOVEL COMPANY
608 SOUTH DEARBORN STREET · CHICAGO 5, ILLINOIS
• PATENTED
For more facts circle 546 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 52)

W. T. Phillips, the system substitutes a second trip under the hydropress for lengthy hand-forming.

Flatwork is placed on dies and hydropressed once in normal manner. It comes out of this operation shaped generally to fit the die, but seldom to fit inspection standards, because hydropressure is not delivered directly to die sides. As a result, wrinkles from top pressure form on part sides, and side offsets come out imperfect.

These wrinkles, formerly smoothed by hand, are now smoothed by the over-press plate during the second trip under the hydropress.

Consisting of a flat piece of 0.125-in. aluminum, the plate lies on top of the part, between it and the rubber face of the hydropress. Two steel flanges are hinged to the top plate by riveted strips. These rims hug the sides of the die and the part it is forming, to prevent buckling and to equalize pressure. In effect, they are the forming die which gives the hydropress force more specific direction.

Heaters Keep Shot Dry

PUTTING electric heat to work has eliminated frequent shutdowns for a messy cleaning job in a shot blast

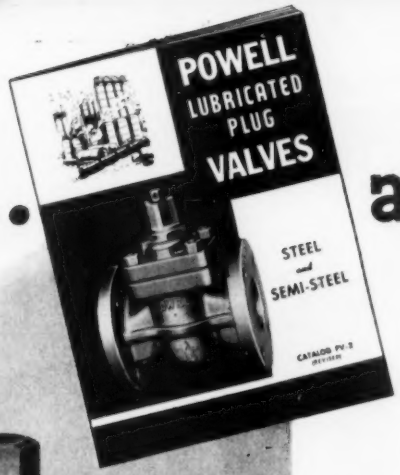
Jim Weaver, Denison plant engineer, points to the heater installation in pit

pit at the Denison Engineering Co., Columbus, Ohio. Chromalox strip heaters, clamped to the walls of the pit, keep the shot dry and free from caking. Prior to the heater installation the natural moisture in the air system had a tendency to make the shot cling together in the pit.

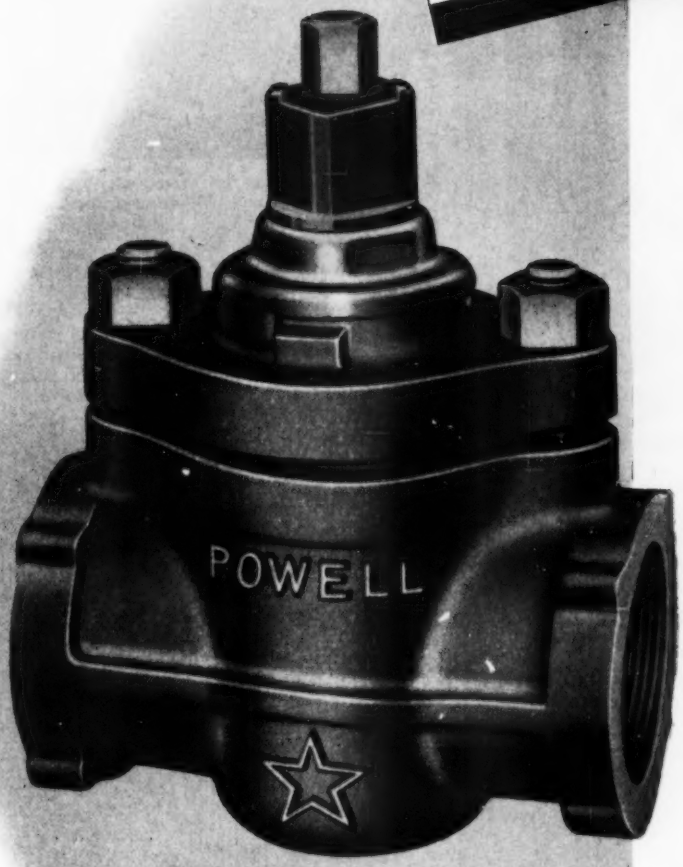
Truck Sounds Its Own Warning

TO MAKE the approach of their electric lift trucks noticeable to employees in the area, the Emerson Electric Mfg. Co., St. Louis, has

New...



and too good to miss!



Now, for the first time, lubricated plug valves that carry the Powell name and measure up to the Powell standards of precision are available in Semi-Steel and Carbon Steel.

You'll want the new PV-2 Catalog in your files. In fact, no valve file can be considered complete without it. And it's so easy to get. Just fill out the coupon below and mail. No charge, no obligation.

As you page through the catalog, you'll see the details that maintain these great new valves in the century-young Powell tradition. Features include quick and positive operation—just a quarter-turn of the Lubricated Tapered Plug to open or close. Lubricant grooves surrounding each port provide a positive seal when the valve is closed. In an open position, seating surfaces are not exposed.

Powell Lubricated Plug Valves are available with Screwed or Bolted Glands. Semi-Steel Valves are available for 175 and 200 pounds W.O.G. Carbon Steel Valves are available for 150 and 300 pounds W.P.

Powell Valves

THE WM. POWELL COMPANY • DEPENDABLE VALVES SINCE 1846 • CINCINNATI 22, OHIO

Free! SEND FOR THE PV-2 CATALOG TODAY

... it's too good to miss!

THE WM. POWELL COMPANY
2507 SPRING GROVE AVE., CINCINNATI 22, OHIO

Gentlemen:

I want to bring my valve file up to date. Please send me a copy of your PV-2 Catalog on Powell Lubricated Plug Valves.

NAME_____ TITLE_____

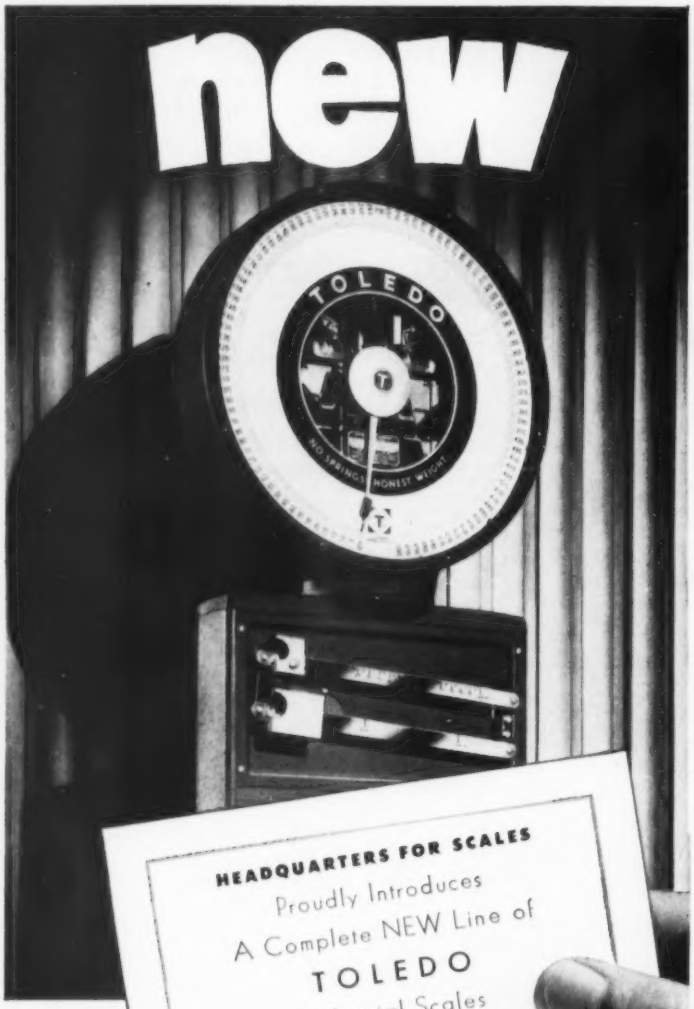
COMPANY_____

CITY_____ ZONE_____ STATE_____

NEW PORTABLE SCALES • NEW COUNTING SCALES • NEW FLOOR SCALES

NEW BUILT-IN SCALES • NEW HOPPER SCALES • NEW TRACK SCALES • NEW PRINTWEIGH SCALES

• NEW BENCH SCALES • NEW MOTOR TRUCK SCALES • NEW MILK RECEIVING SCALES • NEW OVER-UNDER SCALES



44 Ways Better...

A great new line of Toledos! *44 new features* are now added to the traditional accuracy and dependability of Toledo Scales including—double pendulum mechanism in one-piece sector design . . . dial installed to face any of eight directions . . . new clean-line design with handsome gray finish. Complete range of types and capacities. Get your scale information up-to-date . . . write today for the new condensed catalog No. 2001. Toledo Scale Company, Toledo 1, Ohio.

Model 2181 — New version of the world's most widely used portable dial scale.

Today more than ever

TOLEDO®

HEADQUARTERS FOR SCALES

For more facts circle 548 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 52)

Photo: Baker-Hastings Co.

Bell mounted on front wheel of lift truck provides built-in warning signal

developed an effective noisemaker.

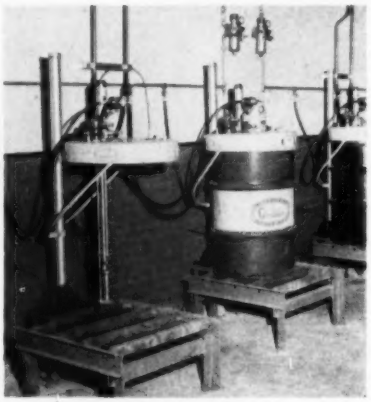
One wheel of each truck is now equipped with a bell bolted to a wheel lug. As the truck moves, the steel ball in the bell runs around inside, creating the warning sound augmenting the horn which the truck driver often forgets to use.

Paint Rides on Rollers

Contributed by Walter Rudolph

AS PART of their new laundry drier fabrication and painting facilities, the Lovell Manufacturing Co., Erie, Pa., provided ease of handling in their paint pumping area.

Platforms fabricated of roller conveyor sections mounted on angle-iron uprights serve as roll-top tables



Roller top platforms permit easy movement of drums under pumping covers

for easy movement of paint drums under the pumping covers. As drums of paint are required for supplying the paint spray areas, they are placed on the tables, the covers swung into place, and the agitation-pumping action, incorporated in the covers themselves, is begun.

What can be done to stop —

AIR POLLUTION?

The answer is "plenty"! Sure there are problems yet to be solved—and new ones will be created as industry develops and expands. But the fact remains that *dust*, one of the major factors in most air pollution problems, has been and can be controlled effectively.

The American Air Filter Company first tackled industrial air pollution over 20 years ago. Since then, AAF engineers have literally "lived" with industry's many and varied dust problems. Result — ROTO-CLONE—the world's most complete line of dust control equipment.

Today, over 20,000 ROTO-CLONE units are helping industry to forestall court injunctions, citizens committees and irate housewives by removing that major irritant —dust. With dust under control, the other problems of air pollution often disappear or take on less importance.

Start now by appointing your local AAF representative as a "committee of one" to check your present dust sources and recommend effective means of control. Call him, today, or write us direct. Remember—"big air pollution problems from little dust sources grow".

You Can Expect the Best From

American Air Filter
COMPANY, INC.

AAF

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AND NOW-

Out of the Great Comes the *NEW*

With the advanced Diamond "Z" Grid, Gould makes another contribution to storage battery perfection! Here is the most recent achievement of the famous Gould Laboratory . . . one more example of Gould progress through *continuous* battery research.

New research developments make it possible to combine the design advantages of the original Diamond grid and the "Z" grid. The Diamond "Z" gives you the structural design of diamond bracing and overall mechanical strength, and still retains the uniform density of grid members so well achieved in the "Z" design.

This advance could only come from Gould . . . for only Gould has the experience with both the Diamond grid and the "Z" grid. The Diamond "Z" grid is another step forward in Gould's research program to give you extra battery performance, longer battery life. When you buy, buy Gould!

HERE'S WHAT YOU GET:

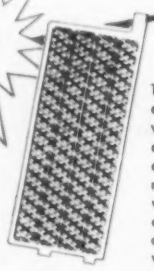
1. A grid built to the demands of users with top performance and long life.
2. A grid that has been tested under rugged operating conditions . . . tough day in and day out service.
3. A grid built to meet tomorrow's needs but available today . . . years ahead of requirements.
4. A grid that cannot "grow" under the toughest kind of treatment . . . with that extra measure of strength for every application.
5. A grid that is built with diamond bridge-like construction . . . with extra strong members to withstand abuse.
6. A grid that delivers the rugged service that future demands will require . . . demonstrated in every conceivable test for long, dependable operation.

Write for the new Catalog featuring this amazing grid that delivers more for your money.

TODAY THE

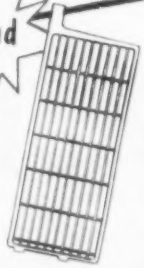
GOULD DIAMOND BATTERIES

1st **THE DIAMOND GRID**



This basic grid design was advanced for its day, highly efficient. For many years, it was the standard by which other batteries were judged.

2nd **THE "Z" GRID**



Here was a tremendous advance in battery design. Intensive Gould research produced an improved casting method, which for the first time made possible larger, longer-life grid members.

GOULD

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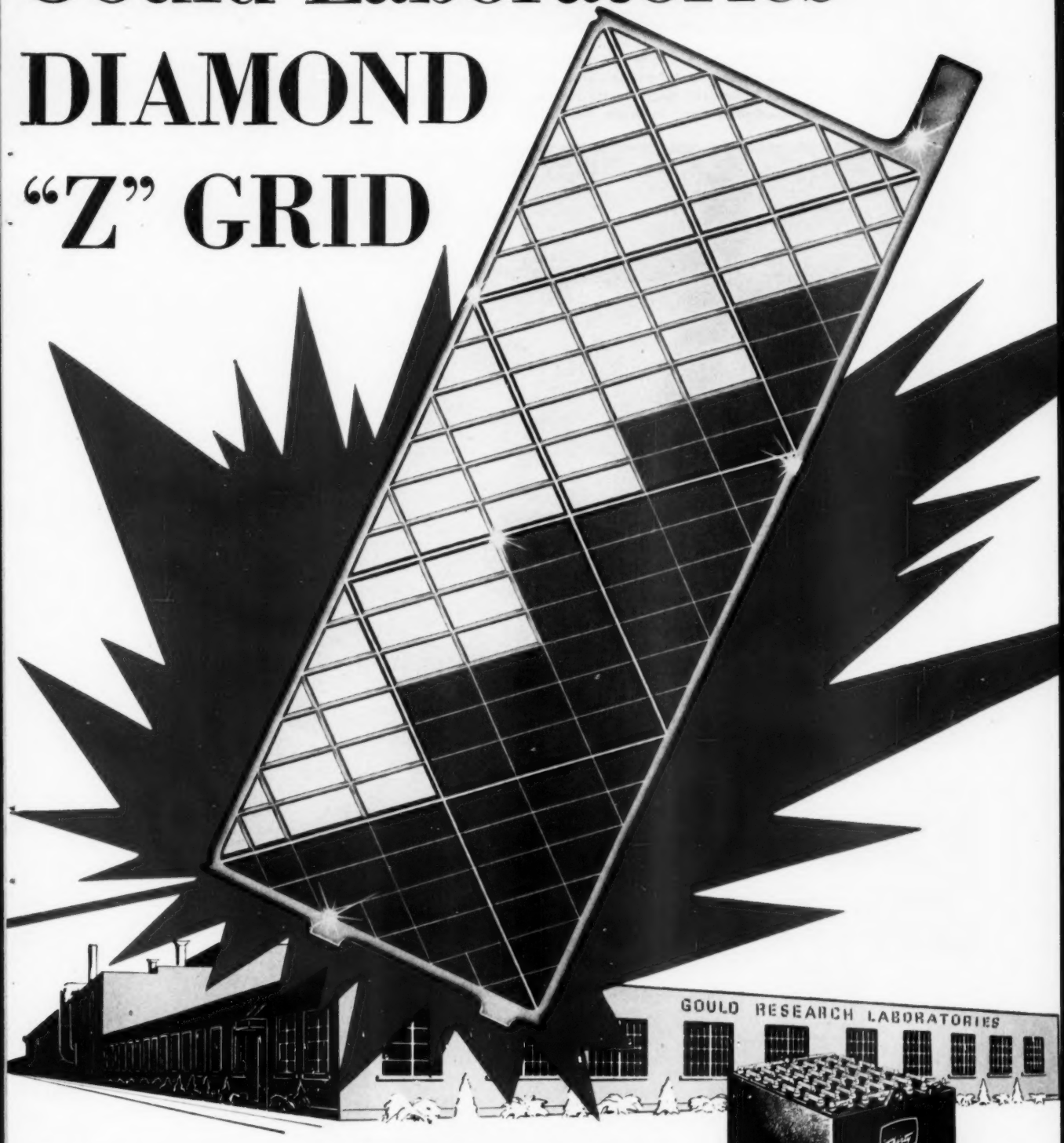
Visit us at the National Industrial Packaging and Materials Handling Exposition, Boston, October 20 to 22, Booth 317.

Gould Laboratories DIAMOND "Z" GRID



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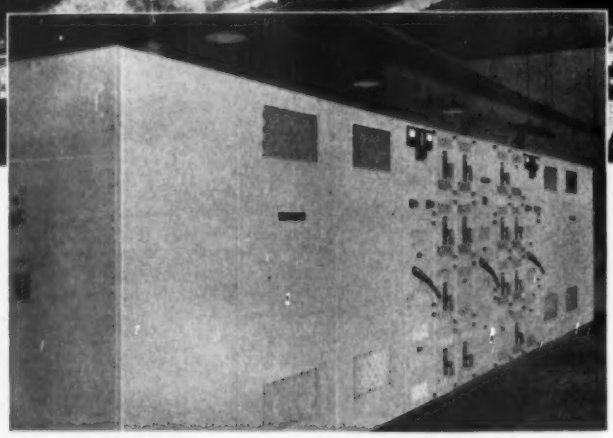
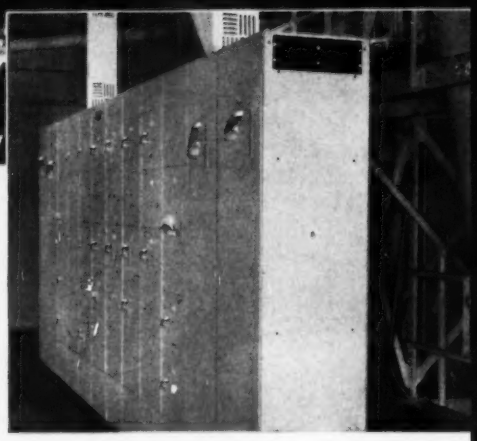
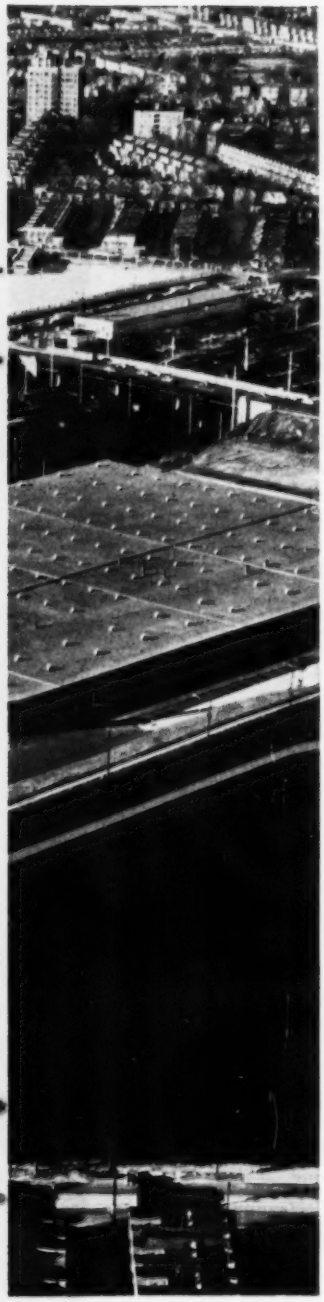
American Stores Co. new plant has world's largest grocery warehouse and nation's most modern bakery—17 acres, or four city blocks, under one roof! All electrical construction by Harry F. Ortlip, Philadelphia, Pa.



Westinghouse 2000 kva Double-Ended Indoor Power Center is one of three located in the bakery where loads are particularly heavy and concentrated.



Westinghouse Type Control Center is compact . . . centralizes control. Starters are mounted back-to-back to save space in the bakery control room.



Excellent service continuity assured by dual, low-cost power system

An interesting power distribution problem resulted when American Stores Company planned its huge grocery warehouse and automatic bakery at Philadelphia, Pa. There, as a supply center for several hundred retail outlets, vast materials handling and food processing activities would be required. Both demanded highly reliable electrical service, at minimum cost.

Working closely with Ganteaume & McMullen, Engineers-Architects, of Boston, Mass., Westinghouse engineers helped adapt a secondary selective radial distribution system.

In the bakery, where continuous operation is exceedingly vital, the system supplies each load center over two primary feeders and through duplicate transformers. Thus, failure of one feeder cable or transformer permits immediate transfer of load to another feeder and transformer. Excellent service continuity is assured.

A lesser degree of continuity is required in the warehouse. Here, a bus tie feeder is located between two substations. It permits a limited amount of power to be made available to the other switchgear should one substation fail.

Westinghouse unitized equipment helped reduce power distribution costs. Use of five Westinghouse Power Centers enabled American Stores to bring high voltage close to the loads. Lower copper losses and minimum voltage drop resulted. Too, short secondary runs saved a considerable amount of copper. Improved voltage at the load was assured; losses were minimized.

Whether you are involved in a new construction project or plant modernization program, Westinghouse offers you the same assistance. Our engineers are ready to help you and your engineers plan a modern distribution system . . . and match it with a complete line of well engineered equipment.

For full details, call your nearest Westinghouse Office. Or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

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COURT DECISIONS — a summary of legal findings of interest to the plant engineer

Prepared by Albert Woodruff Gray

Gas Contract Cancelled

A gas works in Fayette County, Pennsylvania, contracted for natural gas for three years with a provision in the contract with this utility, "As the production of gas from wells and the conveyance of it over long distances are subject to accidents, interruptions and failures, the company does not undertake to furnish to the said glass company a full and uninterrupted supply of gas for the period named herein but only to furnish such supply and for such length of time, limited by the terms hereof, as the wells and pipe lines of the said gas company are reasonably capable of, saving to every other customer upon said pipe lines a similar right of supply and to domestic consumers particularly the first right of supply at all times over any and all manufacturing establishments being furnished gas for any purpose by said company."

The contract also provided that in the event of "failure or material falling off of the gas well employed to supply the gas works the contract may be cancelled upon written notice."

Upon receipt of a notice under this provision of the contract the glass plant sued for an injunction against the discontinuance of the supply the gas company had contracted to furnish.

The defense of the gas company was that the flow of gas had diminished and efforts to supplement the supply by drilling additional wells had been unsuccessful. The Pennsylvania Supreme Court sustained the right of the gas company, under such conditions to discontinue its service.

Liability for Assault By Employee

An oil refining company engaged among other activities in the construction of filling stations, employed a contractor for the performance of this work who in turn delegated to another the cement work to be performed according to the plans of the refining company.

A twelve year old boy walking onto this green cement sidewalk was ordered off by an employee of the contractor and emphasized the order by throwing a hammer that hit and injured the boy's leg.

Holding the refining company liable for these injuries inflicted by the employee of the contractor a Missouri court said,

"It would appear that the general rule to be deduced from all of the authorities in this state is that in order to make the master liable for

the act of the servant, such as is here being considered, the act must be done not only while the servant is employed in the master's business but it must be done in the course of that employment and be one that is done in furtherance of the employer's business.

"Applying the rule it must be held that the employee in throwing the hammer was acting within the scope of his employment. He threw the hammer to prevent the boy from trespassing upon such walk and injuring it. This was done in the course of his employment and in furtherance of the interest of his employers and for the protection of their interests and business which had been entrusted to him."

Responsibility For Dies

Molds and dies were delivered by a Cincinnati firm to a manufacturer for the production of silverware of a particular pattern. Five years later the owner of these dies asked for their return. The dies could not be found and the owner sued for their loss.

It is provided by statute in that state, "When goods and patterns remain for five years in the possession of a person or those claiming under him, to whom a pretended loan thereof has been made, they shall be the property of such person unless a reservation of a right to them is made to the lender in writing and the instrument recorded * * *."

The Ohio Supreme Court under the authority of this statute rendered its decision in favor of the manufacturing company and against the owner of these dies, since the owner had been negligent itself in its delay of five years in taking possession of its property.

The same situation however arose recently in New York in relation to electroplates, where no such statute exists. These electroplates had been left with a lithographer for three years after the owner had been notified to take them back and that the lithographer would not be responsible for their safekeeping.

"The owner of the plates," asserted the appellate court in that state, "had a 'reasonable time' in which to call for them after receiving an invoice for the work with a written notice in red ink that all plates were held in stock at the owner's risk, after the lapse of which the custodian of the plates was transformed into a gratuitous bailee.

"Although a gratuitous bailee is held to but slight care and is relieved from liability in the event of loss due to the owner's contributory negligence, nevertheless he must account for his failure to produce the goods on demand to the extent of showing that he did not take them himself."

Sales By Trade Name

A storage battery manufacturer received an order for "One M** K** 10" x 14" casting machine, serial No. 754-33." The machine was delivered and when the purchaser failed to pay, suit was brought for the price, to which the defense was made that the machine was not fit for the purpose for which it was intended.

Holding that no implied warranty of this character existed in sales made by a trade name, the Supreme Court of Pennsylvania said of such sales,

"In the case of a contract to sell or the sale of a specific article under its patent or trade name, there is no implied warranty as to its fitness for any particular purpose. The machine was sold as a M** K** die casting machine. It is described in the contract as 'One M** K** 10" x 14" die casting machine, serial No. 754-33.' No further specifications were given. It is difficult to see how a trade name could be more aptly used with all its various parts."

Temporary Allowance from Restrictions

An application was made during the war to the zoning board in Oyster Bay, New York for a variance of an ordinance to permit the manufacture, assembling and loading of small arms and ammunition on premises restricted to use for circus grounds, printing plants, hand laundries and wholesale business. The application was denied and later brought for review before the Supreme Court of that state.

In holding this determination of the zoning board illegal and arbitrary, that court said,

"The petitioner has entered into an agreement with a manufacturing

COURT DECISIONS

corporation to lease said premises to them for the duration of the war and for six months thereafter provided a variance of the zoning regulations was obtained. The manufacturing company which assembles, manufactures and loads small arms, ammunition and supplies is an essential industry vital to the war effort. In view of the fact that the petitioner herein seeks a variance only for the duration of the war and for six months thereafter I am of the opinion that the variance should be granted. Where as here the ultimate good can be obtained and a productive use be allowed, the land owner is wronged if the allowance is refused."

Water Contract Unenforceable

A paper manufacturing plant at Dansville, New York, contracted with the village for its water supply, agreeing to pay 1½ cents per thousand gallons used for fifteen years with an option for a renewal of the contract for an additional ten years.

The water commissioners of the village after twenty years notified this paper plant that water would no longer be furnished at the price the company had paid in the past but that in the future instead of 1½ cents the village would charge 4½ cents per thousand gallons.

The paper company sued for an injunction against this increase. The New York court refused to interfere, saying in its decision,

"The contract lacks mutuality and accordingly consideration, because the paper company agrees to pay for water taken and does not agree to take any water nor for any stated period. So far as the water which has not been taken is concerned the contract purports to obligate the village to furnish water but leaves to the paper company to take such an amount as it may choose or none at all. It seems that the contract at best is a mere option to the paper company to take water at a stated price if it elects to do so. Unless both parties to a contract are bound so that either can sue the other for a breach, neither is bound."

Operation of Yeast Drying Plant

An ordinance of the City of Milwaukee, Wisconsin, is, "Any gas plant, factory yard, store house, building or structure of any kind, tallow chandler's shop, soap factory, tannery, distillery, livery stable, cattle yard, shed, barn, packing house, rendering establishment, coal pile, rubbish accumulation, stagnant pool, sink hole, or other thing which shall become noxious, foul or offensive, or which shall emit foul or offensive odors, gasses, effluvia or stenches, or which shall be dangerous or prejudicial to the public health, is hereby declared to be a public nuisance."

A brewers' yeast drying plant was charged with a violation of this ordinance. Holding that the operation of this plant was not a violation of this ordinance, the Wisconsin Supreme Court said,

"We cannot shut our eyes to the obvious truth that if the running of this plant can be enjoined almost any manufacturer in any of our states may be enjoined by similar reasons. Some resident must be incommoded or annoyed by almost any

of them. In the heaviest business quarters and among the most offensive odors of every city will be found persons who from motives of convenience, economy or necessity, have taken up their abode but in the administration of equitable appeals the greater and more general interests must be regarded, rather than the inferior and special. The welfare of the community cannot be otherwise subserved and its necessities provided for.

"The existence of a nuisance depends upon whether there is physical injury to property or occupant resulting from its use and the municipality's interest is aroused only when the injury is substantial and the facts are weighty and important and the public is affected."

Customer Patterns Held In Confidence

The inventor of a bomb microphone and other devices for use in sound recording and light testing prepared patterns for the forms for castings. These patterns were delivered to a machine shop with the agreement that the shop "would only make therefrom such castings as were ordered by the inventor and that it would not make any castings therefrom other than so ordered."

Shortly afterwards this inventor discovered that the machine shop was underselling him in the retail market with castings from his own patterns. The Supreme Court of California in awarding an injunction against the production or marketing of castings from these patterns made the comment,

"We have here a relationship created by a contract where the manufacturer took into his custody certain patterns created by the inventor for the purpose of manufacturing castings from them for the inventor. The machine shop owners do not acknowledge the admonitions of that fundamental precept of honesty and fair dealing enjoined by the Decalogue and supported by prevailing moral concepts. 'Thou shalt not steal' applies with equal force and propriety to the industrialist of a complex civilization as to the simple herdsman of ancient Israel.

"Where a custodian of an article has accepted it under definite terms to hold it and to use it for the benefit of the owner, a confidence has been reposed which should remain inviolate."

Electrical Current Exemption

A fire policy insuring the machinery and equipment of an Arkansas radio broadcasting station contained the exception,

"It is a special condition of this policy that this company shall not be liable for any loss or damage to dynamos, radio apparatus and other electrical appliances or devices, caused by electrical currents whether artificial or natural, including lightning and will be liable only for such loss or damage to them as may occur in consequence of a fire outside of the machines, appliances or devices."

A fire originating from some unknown source, occurred in a transmitter and swept through this cabinet but with no evidence of its cause, whether from artificial or natural electric currents.

"The rule appears to be," said the court in its decision of the action brought against the insurance company on this policy, "that when proof is made of damage apparently within a policy of insurance, the burden is on the insurer to show that the injury or damage was caused by an event from the occurrence of which the insurer had exempted itself from liability."

Then concluding this decision the court added, "The electrical exemption clause excludes from the coverage of the policy only such loss or damage as is caused by electrical currents and will exempt or excuse the insurer only where it is shown that the damage was caused by electric current.

"In this case, although it may be fairly certain that the fire was inside the cabinet and although we may consider the cabinet as a radio apparatus, the fact that the fire was inside the radio apparatus will not exempt the insurer under this exemption clause unless it is shown that the loss or damage was caused by electric currents."

Remington Rand Methods News

KEEPING A FINGER ON 12,000 ITEMS: For an over-all cost of 12½ clerical units, National Motor Bearing keeps accurate, centralized control of 12,000 different items in 7 plants and warehouses. This battery of automatic machines also simplifies payroll procedures and produces reports for analyzing all sales.

Money-saving short cuts in Production, Distribution and Accounting!

We wish you could talk with the Production and Sales people at National Motor Bearing Co. What they say about their new punched-card system makes mighty profitable listening. For example:

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Production Control, Payroll Procedures: National Motor Bearings discovered that punched cards brought them amazing savings in time and money. These high speed automatic machines can give executives complete *daily* production reports. What's more, payroll procedures, are as a by-product, simplified and much faster.

We have prepared a complete Certified Report which gives you all the facts and figures of punched-card accounting at N.M.B. For your copy circle **CR752** at the bottom of the page and mail coupon today.

Stop trouble before it starts!

Your Preventive Maintenance Control must help catch breakdowns before they happen – OR ELSE!

Maintenance Executives, who have a hearty dislike of paperwork, always like our simplified visible systems. There's no confusion, little or no detail work. These visible records: (1) signal the inspection date, (2) permit scheduling of work ahead, (3) pinpoint location of equipment, (4) chart depreciation.

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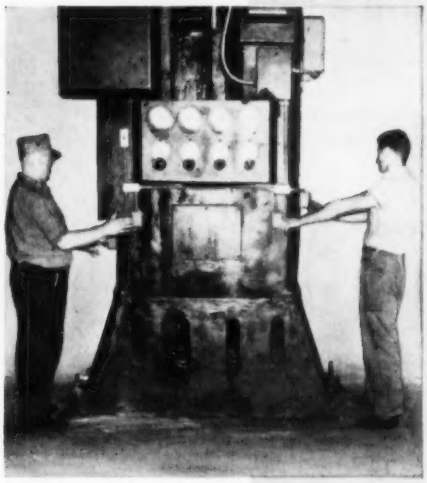
Two-hand **MICRO** trip control on punch press. It is controlled by feather-touch actuation of both switches at the same time.

MICRO trip users report up to 20% increased production from power presses—with *SAFETY*



MICRO trip and selector control. Requires actuation of four hand switches by the two operators. Can be set for operation by one to four switches.

• MICRO trip electrical clutch controls provide instantaneous electrical response. Their light-touch actuation reduces operator fatigue. They permit operators of punch presses, power shears, hydraulic presses and other power machines to work with complete freedom from worry.

MICRO trip cannot be "cheated." It is a two-handed tripping device so designed as to prevent tying, wedging or otherwise securing one switch so as to operate with one hand only. Any component failure automatically breaks the clutch operating circuit. It affords complete protection to machine operators and set up men.

MICRO trip also may be used with single switch control in circumstances where one hand is otherwise occupied. It is also ideal for multiple operator installation. Electrical signal systems can be tied in with MICRO trip. MICRO trip permits single stroke control for positive mechanical clutch machines and automatic cycling control for hydraulic, pneumatic or friction clutch machines.

Send for MICRO trip catalog today. Write to MICRO, Freeport, Illinois, for name of distributor nearest you.

MICRO trip provides automatic cycling control on huge paper cutter. Operator holds two switches until cut is made.

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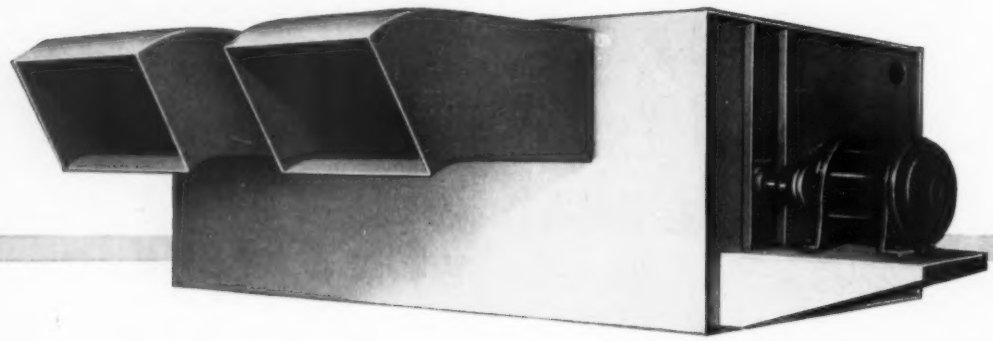
Here's why Trane Torridors can be tailored to fit so many heating jobs!



These *standard* TRANE accessories can be combined with any *standard* TRANE Torridor to solve any heating, ventilating, air filtering or process problem.

- **Many coil types . . .**
  High or low pressure steam—Hot water —Standard or "non-freeze" SD type
- **20 Nozzle arrangements**
- **Wide choice of filters and frames**
- **Two types of by-pass dampers**
- **Mixing and intake boxes**

Now you can have Engineered Heating to solve problems like these with a standard TRANE Torridor!

1. Drafty doorways. Use basic Torridor heating section with nozzles and door switch. Positive blanket of heat every time door opens.

2. Negative pressure. Use Torridor with SD "non-freeze" coils and filter section to introduce fresh tempered air. Maintain positive pressure. Eliminate cold air leaks.

3. Close temperature control. Use Torridor with face-and-by-pass and/or modulated steam distributing coils. Tempers chilly morning air . . . permits mild midday air to enter without overheating.

4. Explosive atmosphere. Use Torridors with spark-resistant fans and explosion-proof motors. Many other variations available.

5. Need for quick warm-up. Use mixing box on Torridor. Fresh air dampers close for quick warm-up—modulate to mix ventilation air with room air.

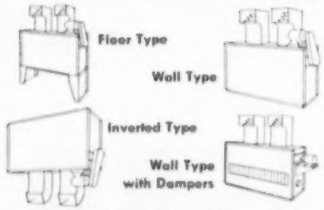
6. Process heating or drying. Torridor has ample room for three rows of high output coils for process heating or drying applications.

7. Compact central system. The powerful centrifugal fans of the Torridor can deliver large quantities of air through duct systems.

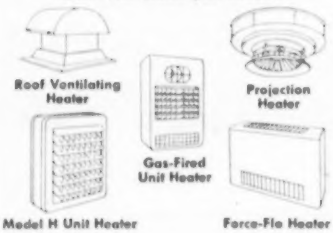
8. Ventilation. Use Torridors for ventilation all year. In the summer, Torridors circulate outside air. In the winter, tempered air.

Problems of fog removal, ice melting, drying, curing and many others can be solved with TRANE Torridors . . . automatically, with standard pneumatic or electrical controls. See your consulting engineer or TRANE office. Write TRANE, La Crosse, Wis., for Bulletin DS-327A.

4 More Standard Torridor Models



And 5 Trane Unit Heaters for spot heat where and when you need it.



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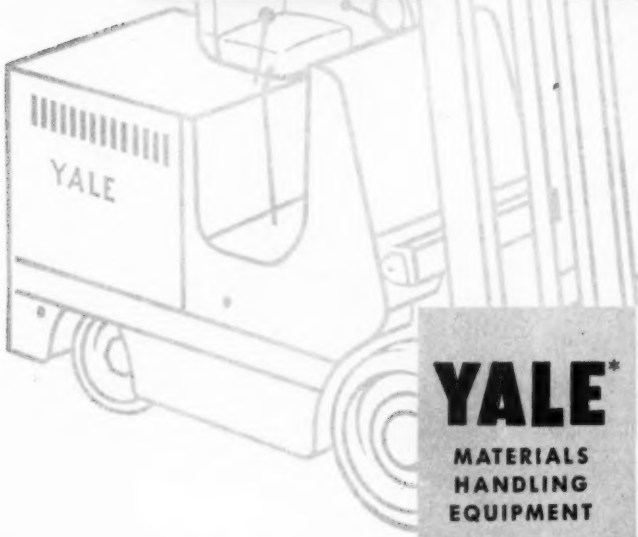

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STEEL STORAGE RACKS
Designed for Convenience, Safety

Good, solid storage racks are needed in any plant that uses steel for either production or maintenance. The author, a former plant engineer and presently engaged in steel warehousing, shows how three basic types are made

By J. G. BALDWIN, Special Orders, Steel Warehouse

STEEL ROOM STORAGE often is the criterion of a plant's housekeeping and safety programs. It is here that the height of orderliness or chaos will be evident. Quite frequently reasonably good planning of floor space will have been made in all other departments.

In the steel room, however, one may find a group of unmatched racks growing as if from seed planted at random. One or two appear to have found more fertile ground than the others, having grown to such an unnatural size that they are braced to wall and ceiling beams in order to contain themselves. Around and between the racks the floors may be littered with steel so that it is dangerous to be in the room, let alone to try to move a bar to a cut-off saw.

If this describes your steel storage room, the first step necessary is the installation of properly designed storage racks.

Steel storage racks of proper design, and of sufficient number are required for three principal reasons: safety, economical handling of material and inventory control. If racks are not properly designed, the rack and the area about it becomes a danger zone. If a rack depends upon wall or ceiling anchors, or if it is not perfectly square and plumb, it is definitely unsafe and should be scrapped. Steel bars that are stored on floor areas in a miscel-

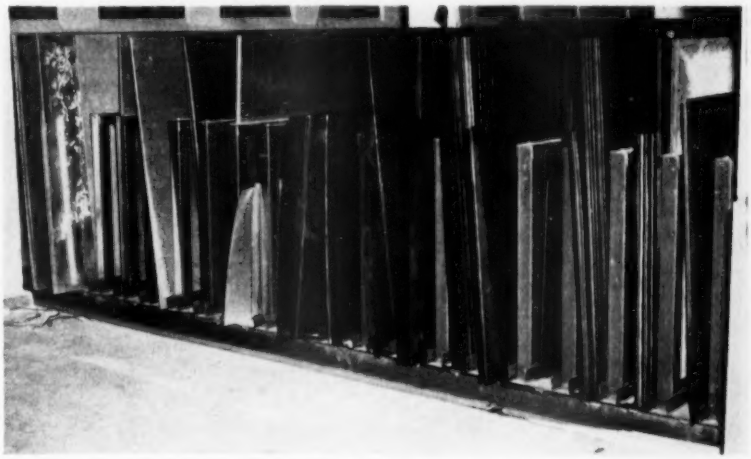


Fig. 1a. Open pocket or top loading rack for storing sheet steel. Drawing is below

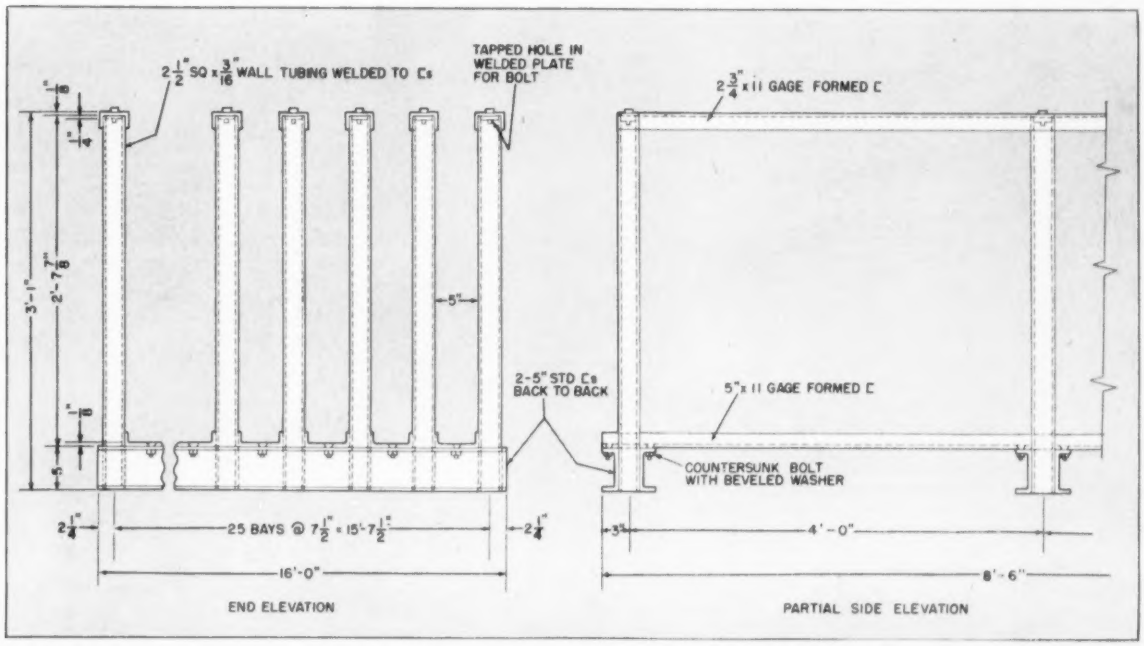


Fig. 1b. Detail drawing of open pocket racks shown in photograph above. Racks may be built for light or heavy material

laneous manner without some form of confinement and without adequate aisle spaces represent a hazard.

Economical handling of steel requires that space be available for movement of the material; that material may be selected immediately according to size and grade; and that storage of material be concentrated at one location. And in order to have inventory control, material must be so arranged that an actual inventory count can be made quickly at any time.

In order to insure safety, economy, and inventory control, storage racks of proper design and type are absolutely essential.

Design: The design of steel storage racks should provide for the following requirements:

1. Shear, bearing, and bending stresses should be investigated so that it is impossible to overload the rack.

2. Rack should be self-supporting and not depend upon any part of the building for braces, ties, or anchors.

3. Rack should take up a minimum amount of space.

4. Pocket sizes and number of pockets should be made to fit exact needs.

5. Rack should be fabricated in sections for easy assembly at the site.

6. Rack should be designed to fit particular location and type of loading facilities.

Type: Most steel storage problems may be serviced by the following kinds of racks: 1. Open Pocket or Top Loading; 2. Wall or Side Loading; 3. Pigeon Hole or End Loading.

These three types of racks are illustrated by photographs and detail drawings.

Open Pocket Rack: The open pocket rack pictured in Figs. 1a and 1b was designed specifically for a sheet rack. This being the case, the pockets are very small, and the rack is made of light material. However, this type of rack made of heavy structural members may be used for large bars or plates, and also for mill lifts (several tons) of any type material.

Sheet rack has posts and base channels shop-welded into solid units. The top formed channel over the top of the posts bolted at time of erection serves both as a guide rail for placing of stock and as a tie member to the rack. The bottom formed channel also bolted at erection is a tie member, but also serves as a bottom to the pockets so that sheet shorts may be held in place. This rack is so constructed that polished sheets may be stored without danger of scratching as there are no sharp edges exposed to the sheet stock.

Wall Rack: The wall or side loading rack shown in Figs. 2a and 2b, is used, as the name implies, for side loading and is necessarily placed

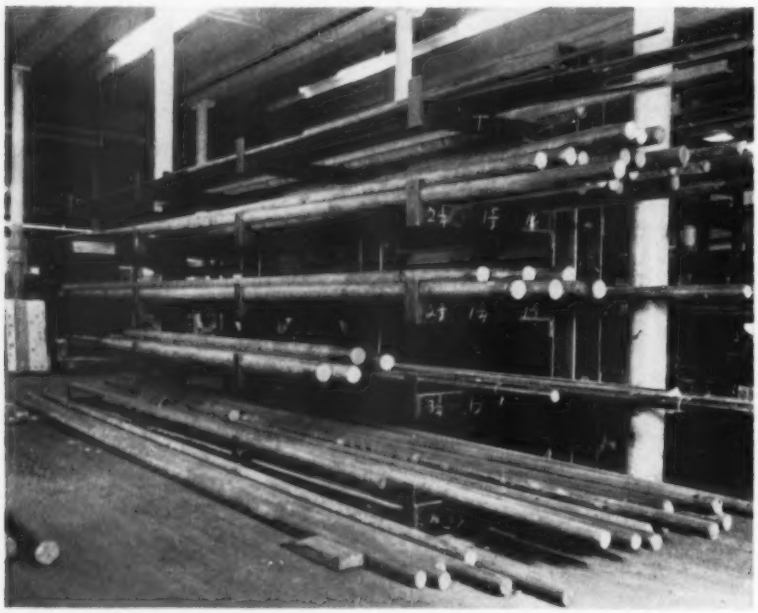


Fig. 2a. Well-designed wall rack or side loading rack needs stability, strength

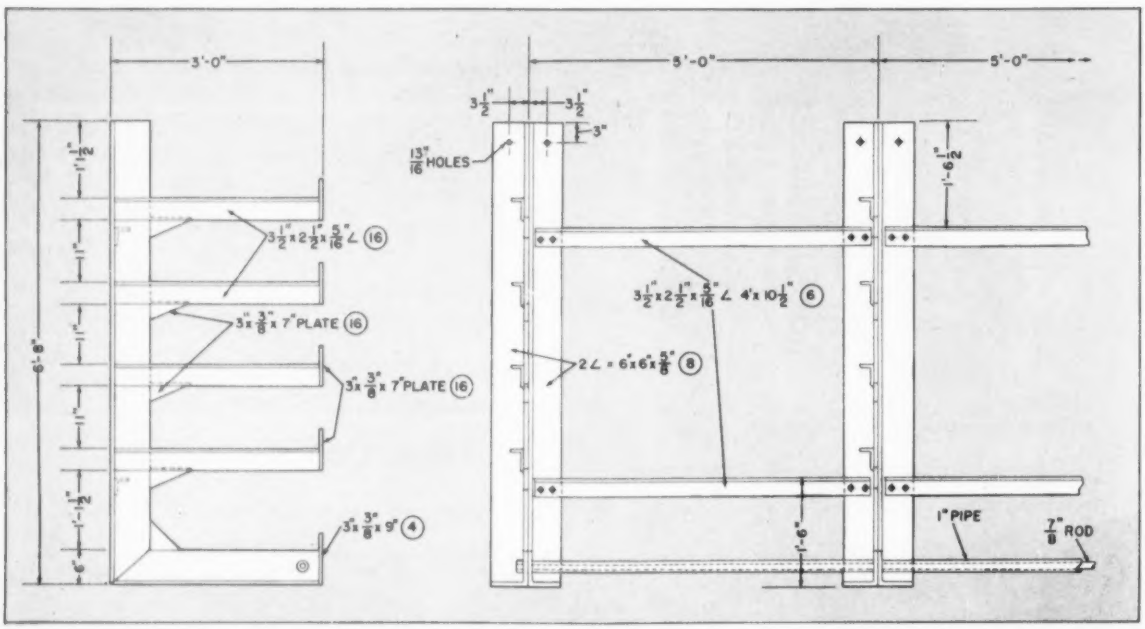


Fig. 2b. Drawing of wall rack. This type of rack has the desired ability to resist overturning action of eccentric loads

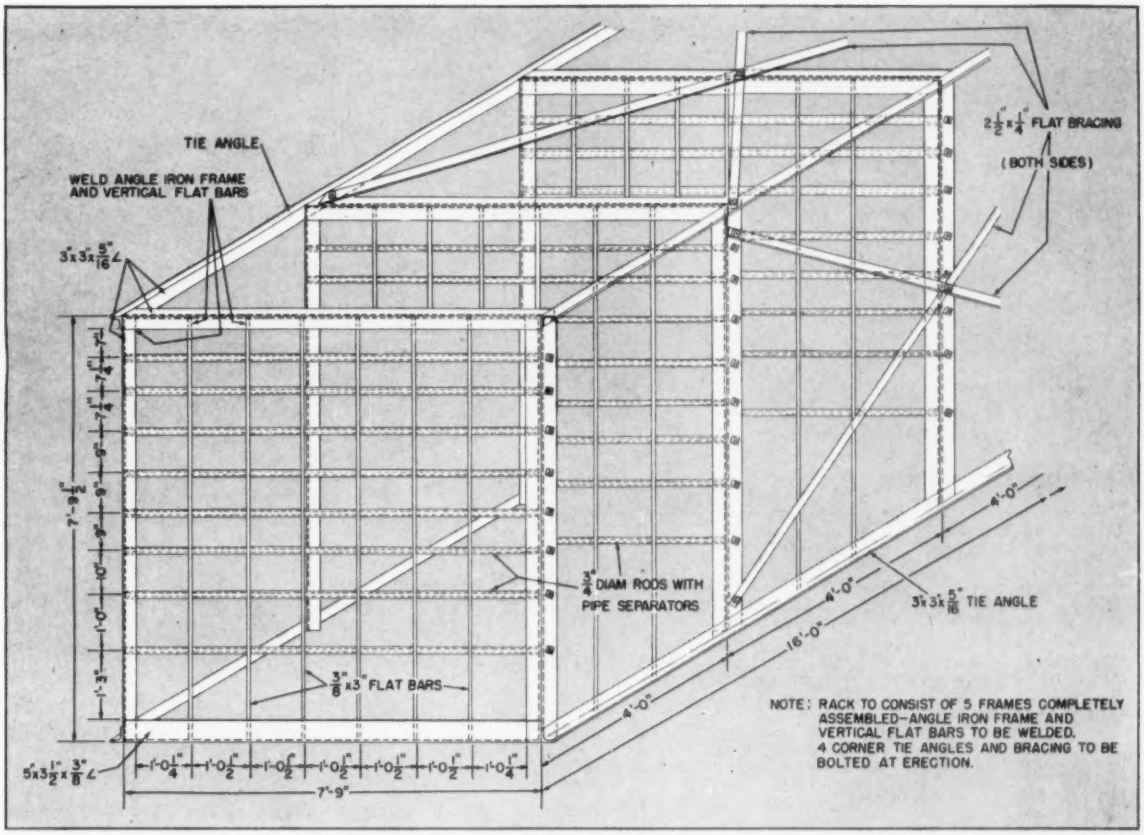

TIE ANGLE
WELD ANGLE IRON FRAME AND VERTICAL FLAT BARS
2½"x¼" FLAT BRACING (BOTH SIDES)
4" DIAM RODS WITH PIPE SEPARATORS
3"x3"x5/16" TIE ANGLE
3/8"x3" FLAT BARS
4'-0"
16'-0"
7'-9"
NOTE: RACK TO CONSIST OF 5 FRAMES COMPLETELY ASSEMBLED—ANGLE IRON FRAME AND VERTICAL FLAT BARS TO BE WELDED. 4 CORNER TIE ANGLES AND BRACING TO BE BOLTED AT ERECTION.

Fig. 3a. The pigeon hole or end loading rack is one kind most commonly used for the storage of bars and bar-size structurals

along a wall or an aisle. An important feature of this rack is its ability to resist the over-turning action of the eccentric loads. The base arm and its connection to the column is sufficiently strong to resist bending moments of pocket loads.

Rack illustrated is bolted to the building columns for sway-bracing purposes only, as diagonal bracing was deliberately omitted in this case. This rack consists of four shop-welded frames or supports on 5 ft centers for twenty foot long stock. These supports have bolted angle iron ties and there is a rod and pipe separator along bottom arms.

Pigeon Hole Rack: The pigeon hole rack, Figs. 3a and 3b, is the most commonly used rack and is used for the storage of bars and bar size structurals. Since an end loading rack must be at least partially loaded and unloaded by hand labor, the size of bars will be limited.

Rack illustrated in Fig. 3 consists of five separate frames on 4 ft centers for twenty foot long material. The outside angle iron and vertical flat members of the frames are shop welded into one rigid unit. The horizontal bars and pipe separators are assembled at the shop. Erection at the site consists simply of bolting the two top and two bottom tie angles and the bolting of bracing on the two sides and on the top.

Vertical flat members supporting the load rest inside the toe of the base angle of the frame thus spreading the load uniformly along the base of the frame. This means that there will be no uneven settling of the rack. Also if the floor needs reinforcement, such additional floor supports need only be placed underneath the five frames.

Photograph in Fig. 3b shows two racks side by side. Since each rack is braced and self-supporting, any number of racks may be placed in one battery.

These three general types of racks are described for the purpose of indicating how easily they may be fabricated and erected and how adequately they will store steel for average plant requirements.

Fig. 3b. Photograph of rack shown above. End loading will limit the size of bars

Fig. 1. Sound system console from which paging is done

With an intra-plant load of 85,000 calls per week it was necessary to install a separate system to keep outgoing calls on the way . . . System was installed and now additional phones cost only price of equipment

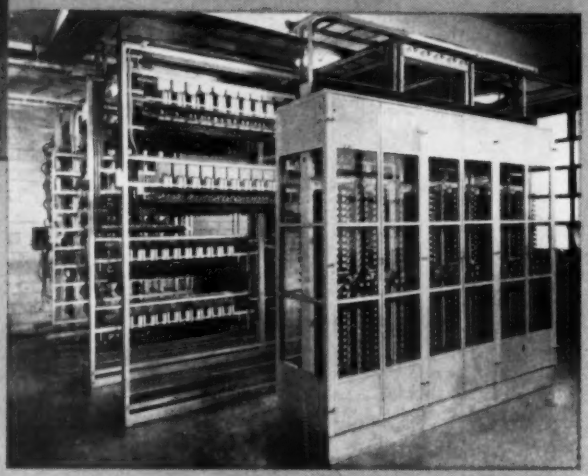


Fig. 2. Switch room also holds record cabinets, batteries

INTRA-PLANT PHONE, SOUND SYSTEMS At Eastman Kodak's Camera Works

By F. G. KIRKMAN, Asst. Director of Facilities, Camera Works

ONE OF THE BUSIEST plants of the Eastman Kodak Company in Rochester, New York, is Camera Works. Activities here demand that there be good communication facilities between departments and their supervisors, and between the several buildings that make up Camera Works. It is also necessary that there be a close contact with watchmen, guards and others responsible for plant security. As a result of this there has now been established one of the best intra-plant communication systems in the country in this plant.

Originally all telephones were leased from the Rochester Telephone Company, and all the Eastman plants in the city except Camera Works and the Navy Ordnance Division, still use this system. In 1939, however, Camera Works installed an automatic system of its own. This has been improved and expanded until today it includes all phases of communication within this plant and the Navy Ordnance Division.

It has been established that these inside telephones alone handle from 80,000 to 85,000 calls a week. In addition to these there are many thousands more of outside calls which must still be made over instruments leased from the Rochester Telephone Company. Peak times for telephone use are 10:00 to 10:30 each morning, and 2:30 to 3:00 in the afternoons.

In a survey made before Camera Works installed its telephone system it was shown that many users in the plant had no business need for outside connections at all. With the present system these users are given only intra-plant phones. Where there is a demand for an outside line such an instrument is installed and in many cases the user has both telephones on his desk, but there are many more inside instruments than outside. This has meant an over-all saving for the plant.

There is an arrangement whereby the telephone traffic on any one telephone can be recorded on a chart. It is an accurate way of determining the telephone traffic on any line and aids the Plant Engineering office in deciding the need for additional service.

After the initial installation of the Camera Works system, additional installations cost only the price of the equipment used. Rental charges are eliminated and there are no outside service costs as all maintenance work is done by regular Camera Works employees.

Maintenance is in charge of one well trained, experienced man who has held this position since the system went into effect in 1939. He has two part-time assistants and when more help is needed it is available from the maintenance department. This means economic savings but, also, assures prompt service.

Maintenance consists of cleaning and making basic checks of equipment and watching for any troubles that may develop. It also includes making daily reports of how many times all trunk lines are busy and how many calls and incompleted calls are reported on the switch board meters.

In 1945 there were 150 more lines added to the system. Also, during the war a Stromberg Carlson sound system was installed throughout the plant as an air raid warning and this has been continued in use for other purposes.

An additional feature of the tele-

phone system is a code call which is used by the Medical or Safety Departments to call a designated elevator to any floor to receive a stretcher or wheel chair patient. The Medical or Safety Departments can arrange for an elevator when a stretcher is needed by dialing Zero and the code digits. The call is relayed to a designated elevator in each building, which is equipped with a loud ringing bell and telephones for this purpose only. The operator answers at once on the phone and is told where to go to pick up the patient and remove him to the Medical Department. Stretchers are kept on racks in convenient locations and employees help with the patient. This system is very satisfactory as it permits an immediate response to an emergency call. Previous to this system a call bell was used to call the elevator but this proved unsatisfactory.

An important phase of the intra-plant communications system is that for the night watchmen. There are six routes that these men take through the plant and a constant check can be maintained of their activities. Two plans previously were used for a while—but neither of these proved satisfactory.

"In Case of Emergency"

Duties of a watchman are to be alert for fire, trespassers or any emergency that requires immediate attention. The system is so set up that there are three minutes between stations on a route and each location is covered once an hour. With the present system the watchman plugs in a special dial telephone which he carries in place of a time clock. He dials a single digit number which causes the system to operate.

This gives an audio-visual watchman's report in the supervisor's room of the building, an audible signal at the individual watchman's station, and prints a permanent record on a recorder in the telephone switchboard room. If for any reason a station is missed a signal calls it to the supervisor's attention. He connects his telephone to the next station on the route so that he can talk to the watchman. The supervisor may also send a man out to see what the trouble is.

If fire or other emergencies arise the watchman can use his telephone to call the supervisor and give a more detailed explanation of the situation. The supervisor's room also contains the sprinkler and door alarm cabinet. This cabinet is equipped with annunciator drops and a visible and audible alarm, which operates when a sprinkler head is released by fire or accident. It also operates if certain exterior doors are opened at other than scheduled times.

If it is a sprinkler alarm it is duplicated on a panel in the engine room so that the attendant is alerted to have the fire pumps ready to operate.

The watchman's printed records are reviewed by supervisory personnel and are inspected and approved by the insurance inspectors. During the war both the Army and the Navy were well pleased with this system. The charts from the watchman's automatic records are changed each week and carefully filed for review if needed.

Sound system previously mentioned, is another type of communication used at Camera Works for paging and music. There is a separate department for this service which consists of a private room

Fig. 3. This is a typical office in the Camera Works. When it is necessary, occupant has inside and outside phones available. Inside phones predominate

Fig. 4. All the equipment necessary for the functioning of the intra-plant communication system at Camera Works is installed in automatic switch room

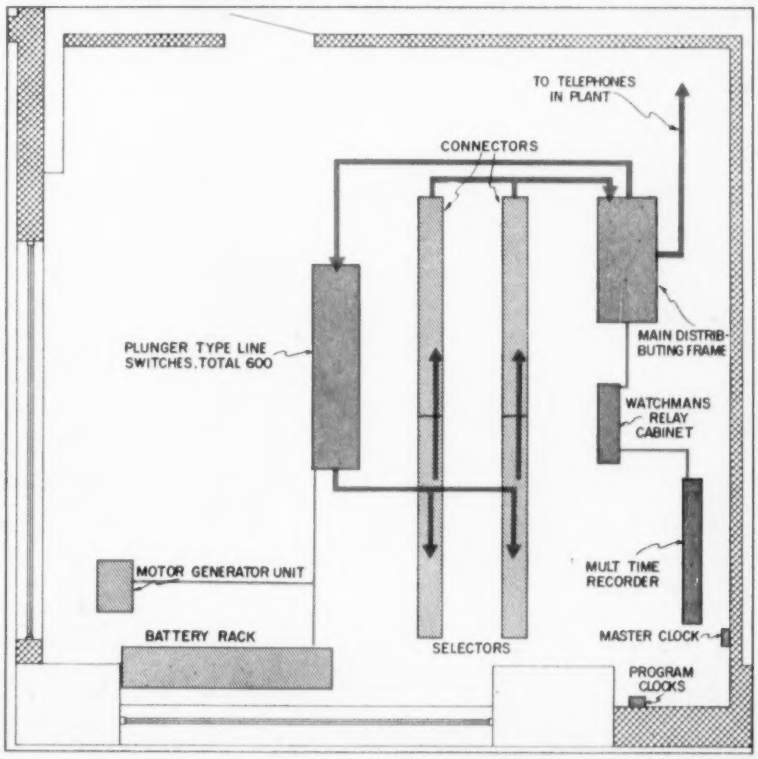


Fig. 5. This is the desk in the watchman's headquarters where signals are received

from which properly authorized personnel may be heard throughout the plant, and a second room containing a switch board, microphone and directory used by an operator. This office also constitutes an information center for plant personnel. A telephone directory in this room is kept up to date in regard to names, offices and other items. Each plant area has a number of speakers. The use of several speakers is necessary to overcome the noise level in the departments.

Paging and Music, Too

Music is provided over the sound system at regular intervals and paging may be done at any time. Music is furnished over a leased wire service which comes into the plant over outside telephone lines.

Paging system is equipped to contact all floors but it is seldom used on the sixth floor where the executive offices are located. It has a tendency to create confusion here and, also it is very easy to contact employees in this area by the regular telephones.

One more branch of the communication system is the equipment which controls a master clock which, in turn, sets and regulates all the clocks in the plant and operates program bells for starting and stopping all working shifts.

In every phase of this system of intra-plant communication there is therefore excellent coverage among buildings and departments and the whole arrangement functions in a satisfactory manner.

WEATHER SHIELD
Helps Truck Loaders Stay Dry, Warm

ONE MORE EXAMPLE of how General Foods Corporation's plant engineers keep GF people happy with their surroundings is the clever and useful device shown below. At the Corporation's Kankakee Distribution Center, Kankakee, Ill., cold weather, particularly when accompanied by snow or sleet, can make truck loading uncomfortable.

Railroad cars were loaded and unloaded within the building, but the truckers were victims of the weather. That is, they were until the "Weather Shield" was designed.

Now, in foul weather, covered body trucks can be loaded without exposing men and product. What's more, it prevents drafts in the warehouse and also should have an appreciable part in cutting fuel bills.

Fig. 1. Drawing shows construction of weather shield frame. Accordion action of the canvas covering is obtained as the outer frame pivots on the sleeves indicated in sketch

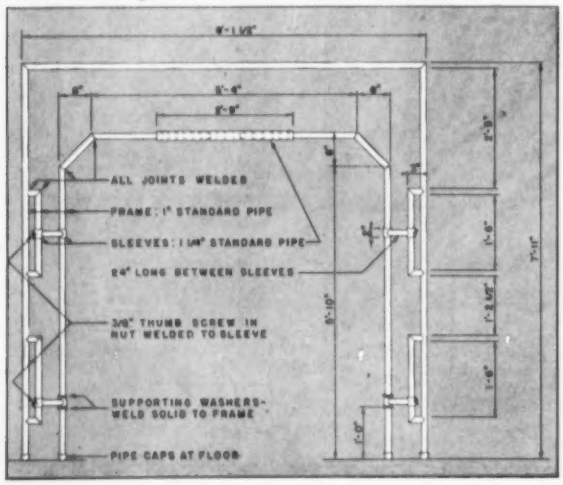
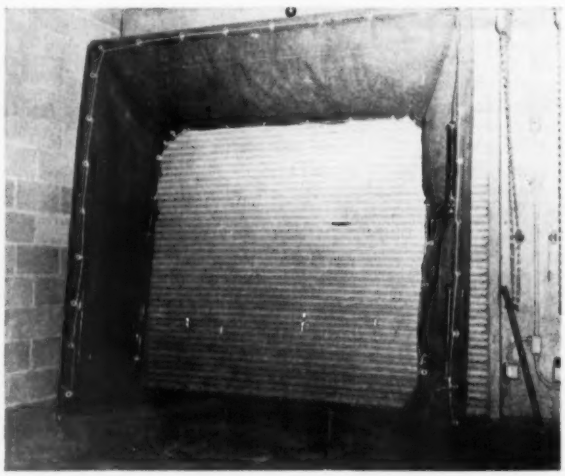

ALL JOINTS WELDED
FRAME: 1" STANDARD PIPE
SLEEVES: 1 1/4" STANDARD PIPE
24" LONG BETWEEN SLEEVES
3/8" THUMB SCREW IN NUT WELDED TO SLEEVE
SUPPORTING WASHERS-WELD SOLID TO FRAME
PIPE CAPS AT FLOOR

Fig. 2. Loading dock shield is shown here in withdrawn position. When truck arrives for loading, the shield can be pulled forward to make weather "tunnel" or shield



Static Conducting V-Belts Prevent Dangerous Sparks

Static built up in a moving V-belt can be dangerous . . . Specifying belts designed to conduct electricity cuts down sparking tendencies . . . grounding of drive is essential

By **FRANK H. RUMBLE**, Engineering Specialist, Allis-Chalmers Manufacturing Co.

STATIC SPARKS in an explosive atmosphere are both undesirable and dangerous. In many semi-hazardous industries where safety engineers have authorized the use of V-belt drives, specially constructed V-belts which guard against static sparks are specified. Wherever V-belt drives are employed in explosive atmospheres, use of static conducting belts is recommended.

A static conducting V-belt, as its name implies, is one which will actually conduct static electricity. While the belt is in motion, traveling around the sheaves, it will carry any static which may be generated, along the belt to the metal sheaves. Here it is disposed of harmlessly, if the motor and driven machine are properly grounded. Thus, by draining away and dissipating static as soon as it is formed, the possibility of building up a static charge to the point where a spark will result is almost entirely eliminated. The principle is the same as that of the familiar dangling chain of the gasoline truck which drags on the street to ground static electricity before it can do any damage.

The static conducting V-belt is sometimes referred to as a static resisting belt. This does not mean that such a V-belt actually resists the generation of static electricity or resists the flow of static throughout its entire length, but simply that it resists the building up of a dangerous static charge by allowing the static to bleed off as it is formed.

Static electricity is caused by two unlike substances rubbing together. Rubber, leather, fabric and all other types of V-belts will generate static electricity while running over sheaves under normal operating conditions. There is no way to prevent it. In many cases with ordinary V-belts the static charge which is generated bleeds off through the air and no sparking occurs. However, in other instances, especially in a quiet atmosphere with low humidity conditions, very high voltages may be built up on the surface of the belt. After a time, the static charge will escape by jumping from a section of the belt to the sheave, the guard or some other nearby conductor in the form of a spark. The potential of the static charge and, therefore, the size of the resultant spark, is dependent on atmospheric conditions, the composition of the belt, its speed, sheave sizes, the belt cross section dimensions and the amount of slippage.

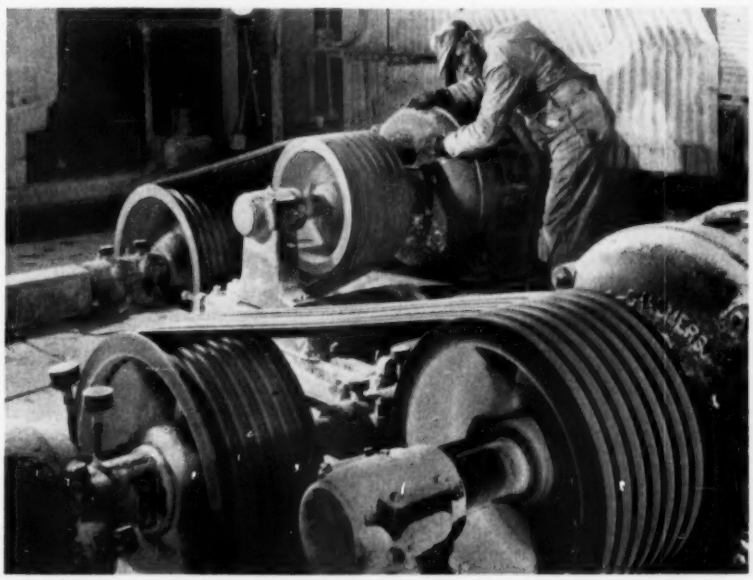
Since there is no practical way to prevent the formation of static, the only logical solution is to remove the static as soon as it is formed. If standard V-belts of high resistivity are used on a drive and a charge is built up, there are several ways of removing the charge. One of the most common methods has been the use of grounded wire combs or brushes contacting the surface of all the belts and bleeding off the static. In some instances the sheaves are grounded and a conductive paint is applied to the belts to make them a conductor of static.

Better Methods

Both of the above methods are effective to a degree, but are generally unsatisfactory because of the maintenance difficulty and the uncertainty as to whether or not they are operating properly at all times. It is easy for a brush to get out of alignment so that it does not touch all of the belts, or paint may wear away quickly, leaving the surface of a belt bare and without protection. To be sure that maximum protection is being afforded it is best to use static conducting belts which are prepared with a static conducting element during manufacture. The static conducting property is imparted by certain materials which are mixed into the compounds used in the belts.

There are two schools of thought among V-belt manufacturers concerning the construction of static belts, one holding for a compounded belt that has conducting properties throughout the complete cross section of the belt, the other prefering static conducting belts with the conducting property in the friction and coat of the cover stock only. Proponents of the second type claim advantages somewhat as follows: While it is a known fact that a perfect conductor will carry an electric charge throughout its entire cross section, it is the charge on the surface only that may induce a spark jump if static is allowed to build up. Therefore, it is the cover or outer surface only of the belt which

(Continued on page 164)



V-belt drives in dusty atmospheres such as this should be protected against build-up. A static spark resulting from such a build-up could be extremely dangerous

Fig. 1. Integral substation consisting of high voltage switch 150 kva dry type transformer and low voltage breakers

Dry Type Transformers Safe, Reliable, Flexible, Survey Says

Facts on transformer installation, maintenance and reliability . . . Reasons for selection and probable replacement policy . . . Atmosphere conditions and overload operation . . . These and other findings show similarity of thought and action among plant engineers where dry type transformers are concerned

DRY-TYPE TRANSFORMERS, equipment of more than passing interest to the plant engineer, was the subject of a survey recently completed by PLANT ENGINEERING. The findings of the survey are presented in the following article with little attempt at editorial comment.

Sent to a list of 500 industrial plants, selected at random from PLANT ENGINEERING's circulation galleys, the questionnaires were returned by 179 of these plants for a return percentage of 35.8.

One condition of the survey, however, required that the respondents report only on the 50 kva-and-over dry-type transformers in their plants.

Of those reporting, the following classifications appeared: 106 had no dry-type transformers in their plants; 28 completely filled in the questionnaire but their units were below the 50 kva capacity requested; this left 45 industrial plants reporting on dry-type transformers of 50 kva-and-over.

Wide Range of Products

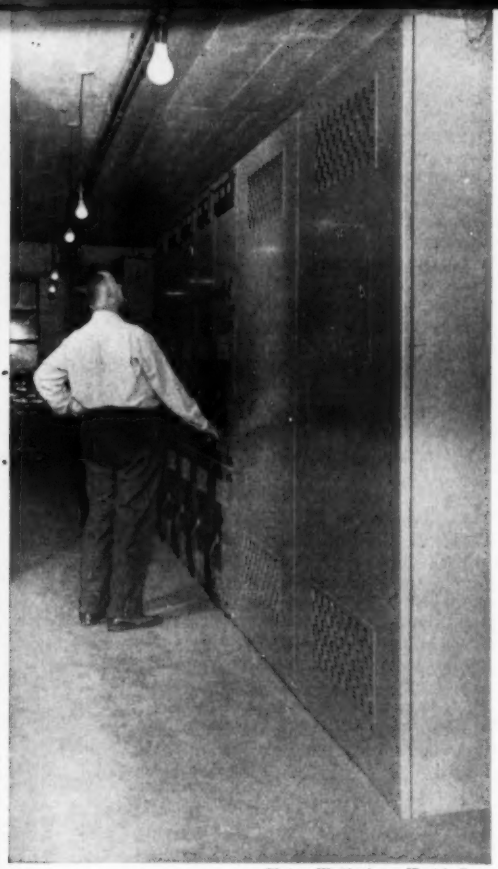
Types of plants reporting, according to the product manufactured, included makers of autos, floor covering, electronic equipment, diesel engines, soy bean products, and pianos. Sizes of these plants according to number of employees, ranged from 100 in the smallest plant—a manufacturer of industrial chemicals, to 21,000—a manufacturer of military aircraft. A complete listing of these plants showing the number of employees, the product of the company, and the total installed capacity of dry-type transformers is presented in Table I on page 86.

As will be noted from the table, the total capacity per plant of the dry-type transformers ranges from 50 kva to 23,600 kva; also that three of the reporting plants either did not give the total capacity of the dry-type transformers installed or stated the figure in such a manner that it could not be calculated from the values given.

The information which appears in the answers throws considerable light on practices regarding dry-type transformer installation, maintenance, and reliability.

1. What is the approximate per cent division by capacity of dry-type transformers according to kva range?

No conclusion could be noticed in the answers to this question. Answers varied as follows: in the 50 to 150 kva range the smallest total



Photos: Westinghouse Electric Corp.

Fig. 2. Unit in control room of brewery

capacity was 2 per cent in one plant, ranging to 100 per cent in 14 of the reporting plants. Percentage by capacity in the 151 to 500 kva size ranged from 1 per cent in one plant to 100 per cent in three of the plants; thirteen of the reporting plants had dry-type transformers in this particular size range. In the 501 to 1,000 kva size group the figures ranged from a low of 25.3 per cent in one plant to 100 per cent in another plant; the total number of plants reporting dry-type transformers in this size was nine.

In the 1,001 and up kva size the percentage ranged from a 35 per cent low to an 89 per cent high. Only three of the 45 reporting plants had dry-type transformers of this size installed.

Distribution Systems

2. On what type of distribution system are dry-type transformers used in your plant?

In this question, the respondents were given five types of distribution systems to check: radial, secondary selective, primary selective, network, and "other."

Most common type of distribution system proved to be the radial used in 23 plants; 10 plants said that dry-type transformers were used on network systems, 9 reported that they were used on "other" types of systems. Secondary selective and primary selective were mentioned 5 times each.

3. Where are dry-type transformers located when used in preference to liquid-immersed? Also, what dry-type is used—ventilated or sealed?

By far the greatest number of dry-type transformers were located somewhere in the plant proper. Twenty-nine of the respondents answering this portion of the questionnaire stated that they were located in the plant, and of these, 27 were of the ventilated and two of the sealed type.

Twenty-two of the reporting plants had dry-type transformers located in balconies, of which twenty-one were of the ventilated type and only one of the sealed type.

Third in the points of definite location were floor installations which fifteen plants reported; of these, twelve were of the ventilated type and three sealed. Office locations accounted for ten installations of which nine were of the ventilated type and one of the sealed type. Two plants reported that the installation was underground—both of these were of the ventilated type. One plant reported a roof installation of a ventilated dry-type transformer.

4. What factors determined your use of dry-type transformers instead of liquid-immersed transformers? List below, giving the three most important factors in their order of importance.

This question indicated that three factors ran a neck-and-neck race as the motivation for the installation of dry-type units. These three factors were: "Reduced Maintenance," which received six first place votes, fourteen second place votes and ten third place votes; "Less Hazard of Fire and Explosion" received eleven first place votes, thirteen second place votes, and eight third place votes; "Lower Installed Cost" received twelve first place votes, three second place votes, and eleven third place votes. "Better Appearance" apparently was an influencing factor in very few of the cases—this accounted for one first place vote; one second place vote, and eight third place votes.

Under "Other Reasons" the factors which influenced the use of dry-type transformers were listed: One of the respondents pointed out that with dry-type transformers, vaults were not required. Two of the respondents pointed out that "convenience in spotting-in lighting loads" was the determining factor. Two other respondents mentioned that dry-type transformers were "best adapted for installation at the center of the electrical load."

Other reasons given were "easy replacement" and "light weight." "Better delivery," and "availability" of the unit.

5. Will your present operating policy for replacement and new installations of transformers tend to increase or decrease your percentage of dry-type transformers?

The answer to this was overwhelmingly in favor of increasing the percentage of dry-type transformers in use in the respondents' plants. In fact, 31 mentioned that they would increase the percentage as time went on, while only four said that the percentage would decrease. Nine pointed out that the percentage would probably remain substantially the same, or that they were undecided as to what policy to pursue in the future.

6. When purchasing dry-type transformers are the manufacturers' standard lines acceptable or are special requirements and accessories specified?

It was quite apparent from the answers to this question that an overwhelming percentage of users are, on the whole, satisfied with the design of the present standard lines of dry-type transformers. In fact, 36 answered yes to the above question with only two dissenting.

Individual Problems

One mentioned that he required only "minor changes." Another pointed out that the standard lines were "usually o.k., but that we must watch impedances for parallel operation." Still another said that the only special type transformer required in his plant were "460 volt, 3 phase—115 star secondaries neutral grounded for mancoolers in the forge shop." Another respondent with problems pointed out that they need "both (standard and special) depending on requirements."

7. What accessories do you require to be provided with dry-type transformers?

According to the response received, most users of dry-type transformers are entirely satisfied with the design of the unit as provided by the manufacturers. Thirty-three of the respondents indicated that no accessories were required other than the equipment supplied on standard units. Of those who did require accessories, six had lightning arresters installed; six had winding temperature indicators and four requested forced air cooling.

8. If forced air cooling is used, are the fans controlled automatically?

As indicated above, only four of the respondents used forced air cooling on their dry-type transformers. Of these four, three controlled all their fans manually, and one had the units hooked up electrically so that they would operate from the winding temperature of the transformers.

9. Do the dry-type transformers operate in the atmosphere normal to the surroundings, and what is this atmosphere?

Eighteen of the respondents indicated that foreign particles were present in the air in appreciable quantity; seven of the respondents indicated that fumes were present, while three mentioned that moisture,

Tabular arrangement of reporting companies showing product manufactured, number of employees and total capacity of dry-type transformer installation

NO. OF EMPLOYEES	PRODUCT OF COMPANY	TOTAL CAP'Y DRY-TYPE TRANSFORMERS
2,000	Lumber, paper products	50
2,000	Elec. distr. & control	80
185	Straw and liner board	90
1,400	Automobiles	124
100	Industrial chemicals	135
450	Protective coatings	150
200	Pianos	150
Not Given	Not Given	450
408	Sales books	500
500	Shipping containers	600
2,000	Heating equipment	750
2,000	Domestic Htg. cooling equipment	750
1,000	Weldments	750
500	Oil field equipment	750
2,000	Mech. rubber goods	1,000
1,200	Mining equipment	1,000
2,000	Paper specialties	1,050
1,500	Paper making machinery	1,100
2,000	Refrigerators	1,200
1,800	Automobile diff. & axles	1,500
1,400	Diesel engines	1,500
875	Petroleum refining	1,575
4,000	Automobile radios	1,700
3,000	Plastics	1,725
6,000	Electronic equipment	1,800
1,900	Air conditioning	2,000
2,000	Farm machinery	2,000
3,000	Tires, tubes, plastics	2,000
4,000	Floor covering	3,000
2,000	Public seating	3,500
1,200	Metal containers	5,000
500	Rope, twine, etc.	6,000
2,000	Trailers	6,000
1,800	Screw machine products	7,000
5,800	Industrial power equipment	8,000
5,000	Industrial pwr., farm equipment	8,400
4,000	Chocolate products	9,000
1,000	Chemicals	9,950
6,500	Crawler type tractors	10,105
3,000	Farm equipment	12,875
9,000	Electric light bulbs	17,100
21,000	Military aircraft	23,600
1,300	Dictating machines	Not Given
500	Soy bean products	Not Given
350	Automobile replacement pts.	Not Given

in greater than normal amounts, was present in the atmosphere surrounding the transformers. Strangely enough, of those reporting foreign particles, fumes, or moisture, only two were experiencing (see question 15), a lower degree of reliability from the dry-type transformer than from the liquid-immersed units.

10. Does your maintenance program include a schedule for cleaning transformer windings periodically?

Out of the forty-five respondents, only twenty-three had thus far established a definite schedule of cleaning. Frequencies of these cleaning schedules varied—the schedule of one respondent called for cleaning every two months; another had a four-month cleaning schedule; ten cleaned the dry-type transformers semi-annually, while another ten cleaned them yearly. One respondent allowed his units to go for three years without cleaning.

Among the methods employed for cleaning, air blowing with closely controlled pressures proved to be the most popular, but in some cases it was used in combination with a vacuum clean-up following the blowing. Statistical breakdown of the methods employed showed that seventeen used air blowing, eight employed vacuum cleaning either by itself or in conjunction with air blowing. Manual wiping was employed by five respondents, and one resorted to brushing.

Costs Investigated

11. Does your experience indicate that the cost of a maintenance program for dry-type transformers is more or less than that for a corresponding number of liquid-immersed transformers?

Here again the reliability and the maintenance-free aspects of dry-type transformers was illustrated by the favorable response. Of the twenty-three respondents answering this particular question, fifteen said that the cost of maintaining dry-type transformers was less than for a corresponding number of liquid-immersed units. Five respondents said that the cost was about the same; three said the cost was greater.

Comments made by those who checked the "less" section are as follows: One reader modified his answer slightly to the extent that "cost is less if dry-type transformer can be installed in a clean, dry location. It can be checked easily." Two others pointed out the reason for the lower cost, "no oil filtering or replacement cost." A strong booster for dry-type transformers says that "cleaning procedure is simple and direct and does not require the use of special utility company equipment which is necessary at this plant for reconditioning and filtering the coolant. Also, the secondary network system makes it possible to clean a unit on regular time without employing workers overtime."

Still a fourth respondent mentioned that "dry-type transformers can be dusted in far less time than is required to filter oil. It is possible that once every five to ten years they should be reimpregnated which is about equal to new oil in a liquid-immersed unit." A fifth respondent also said "Less. However they are quite close as the frequency of check and the filtering of oil in the liquid-immersed is much less than the frequency of check in the dry-type." Still another, "dry-type much less because oil in all liquid-filled is treated twice yearly in our plant. Sometimes this is done on an overtime basis."

Those who thought that the liquid-immersed transformer cost less to maintain remarked as follows: "Our rate of failure (of the

dry-type) has been excessive by comparison, without justification." And, "Our experience with liquid-immersed has been with 1500 kva, 33,000/4600 outdoor units. These units have been in operation since 1929. We have cleaned and painted each year and changed oil once. Oil has been filtered about once a year."

One respondent who thought that the maintenance costs were about the same commented as follows: "We have fifteen askarel and six dry-type. In seven years only one askarel has required filtering."

12. What periodic inspections and tests are made to determine the condition of the insulation in the transformers? Check list of tests.

Visual observation seemed to be the most prevalent practice, but very often when this portion was checked it was also accompanied by another type of test. In addition to visual observation the most commonly followed practice included a megohmmeter resistance test. Twenty-three of the respondents used the megohmmeter of which twelve checked the insulation annually, two checked it semi-annually, while two checked it on three and four month schedules.

Another Popular Test

Third most popular type of test was the "a-c potential." Nine of the respondents employed this type of test—one of them every two years; two every year; two semi-annually; two more every two months; another one used this test every month, while one lone respondent used an a-c potential test weekly.

A power factor test was employed by three of the respondents. One of the respondents remarked, "We check so that none of our transformers are carrying more than 75 to 80 per cent full load at any time." Two respondents utilized a power factor check yearly while one employed this test every month.

13. Are your dry-type transformers subjected to any unusual overloads?

Response here was overwhelmingly in favor of the "no." Forty checked the "no" portion of the question while only three checked "yes."

The second part of the question, "If so, at what per cent of rated load, for how long, and how often?"

Three who said that their units were subjected to unusual overloads reported as follows: One had a 115 per cent rated load for a duration of 4 hr occurring approximately every three weeks. A second respondent had a 125 per cent rated load which endured for 3 hr and occurred approximately once a month. The third also had a 125 per cent rated load for periods of 2 hr; no frequency of occurrence was listed.

14. Are your dry-type transformers subjected to any surge voltages? If so, are lightning arresters used?

Thirty-five of the respondents said that their dry-type transformers were not subject to surge voltages. Eight said that theirs' were. Of the eight whose dry-type transformers were subjected to surge voltages only five employed arresters.

15. Does your experience indicate that the reliability of dry-type transformers is greater or less than liquid-immersed transformers in the locations where you have used both, under similar conditions?

None of the respondents claimed greater reliability for the dry-type. However, twenty-nine respondents said that the reliability of the dry-type unit was equal to the liquid-immersed transformer while four said that the reliability of the dry-type unit was less.

16. Has any unsatisfactory operation been experienced with dry-type transformers?

This portion of the survey indicated that five had had unhappy experiences with dry-type units while twenty-seven pointed out that the operation of this type of transformer had been entirely satisfactory. Some of the remarks made by the former group follow. "Some makes won't even handle their rating." "They hum." "Some are very noisy." "Primary shorts. The insulation breaks down without overload in relatively short time." The first and last of these remarks came from users of small dry-type units (50-150 kva). On the whole, users of the larger units had experienced no difficulty or unsatisfactory operation.

Tear Sheets Available

Readers wishing tear sheets of any article appearing in the issue for their personal file may obtain them by indicating the item desired on one of the post cards appearing in this issue.—Editors

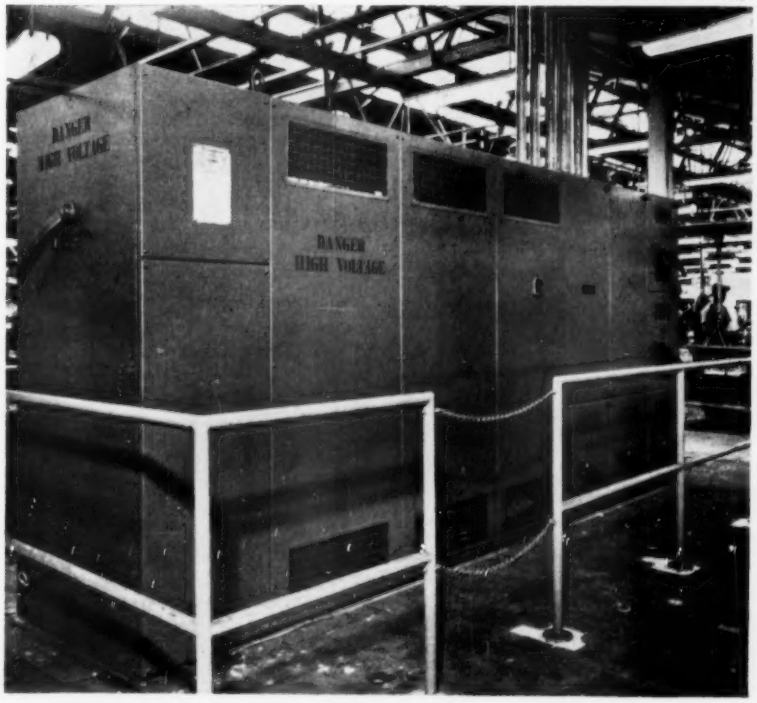
One man who was well pleased with the dry-type unit said "In over eleven years operation trouble has been restricted to one insulation breakdown; one fire requiring a rewind; bushing in one unit cracked. We consider this very good." Still another said "We have had no trouble in approximately ten years."

17. What suggestions for improvements of dry-type transformers do you have?

On one thing, most users agreed. Many of them, sixteen to be exact, would appreciate a dry-type transformer with a lower sound level. Other than that the suggestions were divided as follows: Larger kva ratings—four; higher voltages—two; more taps—seven; higher impulse levels—two; lower losses—five; and lower impedance—one. A few of the comments made in this section on this included "I think higher kva ratings would be helpful especially where room is important." "Build protection into the windings or into the case." "Discontinue pigtails and use mounted lugs for connections."

Fig. 3. Modern indoor industrial network unit, 750 kv-a capacity, consisting of one 3-position high voltage selector switch and two incoming cable feeders, in addition to 750 kv-a dry-type transformer, and low voltage network protector

Photo: Westinghouse Electric Corp.



REDUCE PLANT ACCIDENTS WITH

MACHINE GUARDS — Watchdogs of Industrial Safety

Industrial accidents in a plant can mean loss of life or limb to the operator and loss of production time and compensation expense to the company . . . It is important to see that safety measures and practices are observed

By **FRED W. BRAUN**, Vice President, Accident Prevention, Employers Mutuals of Wausau

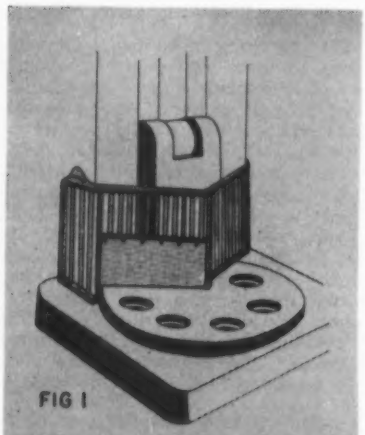


FIG 1

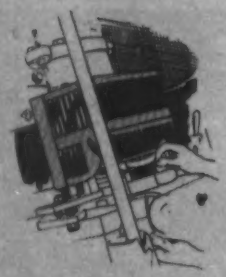


FIG 2

ACCIDENT RECORDS show that industries where metal is machined can well afford to devote more attention to safe operation. Both the frequency and severity rates for industries in this classification are higher than the national average for all types of work.

While working with machinery ranks third as the cause of all disabling injuries in industry, it takes first place as the cause of permanent partial injuries—almost a third of the total. This is because many of these machinery accidents result in loss of hands, fingers and the hopeless maiming of bones, muscles or nerves.

Such accidents are expensive, too. For instance, New York State data for a typical year showed that compensated injuries from the operation of machines averaged $488 compensation per injury, as against $330 for all compensated injuries. With proper protection for the operator these accidents are almost wholly preventable.

High among the major causes of all accidents is the power or stamping press. These presses take an enormous toll each year. Each press and each operation usually presents separate problems, due to the varying size and nature of the object produced, and the consequent variety of dies that are used.

It is said that the human mind is not capable of performing 10 to 20 thousand identical operations each day without momentarily wandering—and one careless move during a mental lapse and a press operator may be crippled for life.

Power press accidents result from one or a combination of the following conditions:

1. Failure of management to provide safe work places and machines.
2. Failure of supervisors to keep work places safe, and to have machines properly guarded, inspected, maintained and operated.
3. Failure of workers to use the facilities provided, together with violation of rules laid down for their safety.

While the operation of power presses is generally regarded as hazardous, it can be relatively safe if a few fundamental principles are followed. Among these are: design-

Semi-automatic feeds such as the dial feed, Fig. 1; gravity feed, Fig. 2; follow feed, Fig. 3; push or pull feed, Fig. 4; and swinging die, Fig. 5, should be equipped with safety guards. These guards help prevent possible injury to the operator

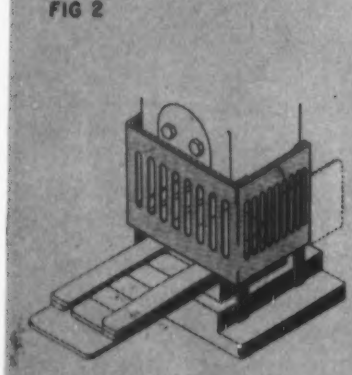


FIG 3

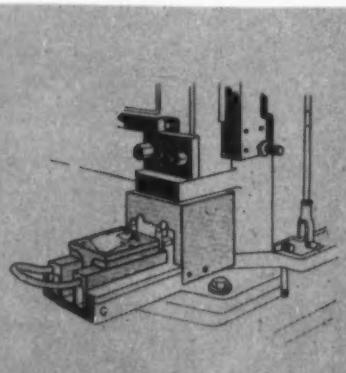


FIG 4

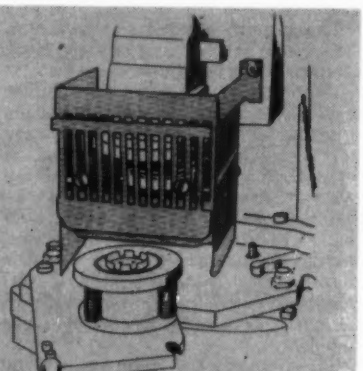


FIG 5

ing of the dies for good production and facility of safe operation; efficient feeding and ejection methods; effective point of operation guarding; proper press maintenance; proper operator training and supervision.

Automatic methods of feeding presses are preferable from a safety point of view to either semi-automatic or manual feeding. Such feeding methods make it possible to enclose the die completely and the operator can load the feed mechanism and start the press, but does not have to be in the vicinity of the press at each stroke. The cost of automatic feeds is generally high and must be considered in relation to production volume.

Semi-automatic feeds, which allow the work to be placed in position without requiring the operator to insert his hands into the point of operation include: The dial feed, Fig. 1, where all pinch or shear points on the dial feed itself should be guarded. The gravity feed, Fig. 2, is one in which the piece is fed into an inclined chute. A pick or other means should be provided for removing pieces of stock that may jam in the die. This type of feed is used for many blanking and forming operations of small or moderate size. The follow feed, Fig. 3, may be used when the thickness or shape of the part is such that one piece may be used to push another like piece. As each new piece is fed, the finished piece is ejected. Push or pull feeds, Fig 4, approximate the action of hand feeding without placing hands in the danger zone. This type is particularly adaptable to forming operations from rectangular stock. The swinging die, Fig. 5, is used with a complete enclosure guard. Die is shown in forward position ready for loading or unloading. Press is equipped with a safety device which will not permit tripping unless the die is in position.

Other types of guards include interlocking barrier guards which have hinged or movable sections connected with an interlocking device that will prevent tripping the press while the section is open.

In many cases because of the nature of the work or the use of dies on comparatively short runs, it is still necessary to use presses where the operator must place his hands within the operating range of the press ram. In such cases it is desirable to make use of guards which will remove the hands from the danger zone in all cases of ram descent.

Among the most commonly used guards of this type are the "pull out guards" where wristlets on the operator's hands are attached to cables extending from a ram connection to the rear of the operator. As the ram descends, the operator's hands are pulled away from the danger zone.

Other devices include a "sweep guard" activated by the motion of the ram to push the operator's hand out of the way, a two-handed tripping device that requires use of both electronic safety devices which emhands to trip the press ram and ploy interruption of a light beam to protect the danger zone.

It is axiomatic that all pulleys, belts and gears should be carefully guarded. Hinged covers may be used to allow easy access for oiling, changing belts or making adjustments.

All in-running rolls which constitute a nip point should be guarded with a stationary guard, or with a bar so arranged that the machine will stop when pressure is applied against the bar. Fig. 6 shows the use of ¼ in. fiberboard as a roll guard on a leveling machine used to roll metal sheets.

Square shears should have the knife guarded so that the operator's fingers cannot reach the knife. Figure 7 shows a squaring shear guard slanted in front of knife to permit better vision of material being cut. Stationary square shear guard with five pockets that extend through openings in pad is shown in Fig. 8. Such an arrangement makes it possible to feed safely close to the blade.

Milling machine cutters should be guarded so that the fingers cannot reach between the work and the cutting head. Two different types of milling machine guards are shown in Figs. 9 and 10.

In this article we have touched on but a few of the many hazards connected with industries where metal is machined and the methods which have been found helpful in keeping accidents under control. We must not overlook mention of the importance of proper handling of materials, good housekeeping, proper protective clothing, care in grinding and welding operations and the constant need of proper training.

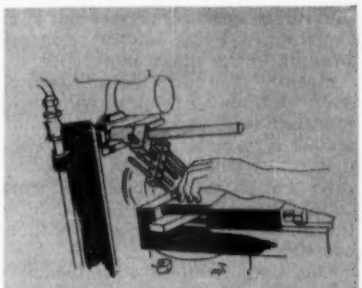


FIG 10

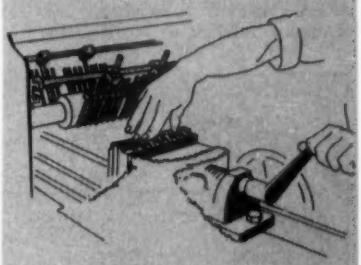


FIG 9

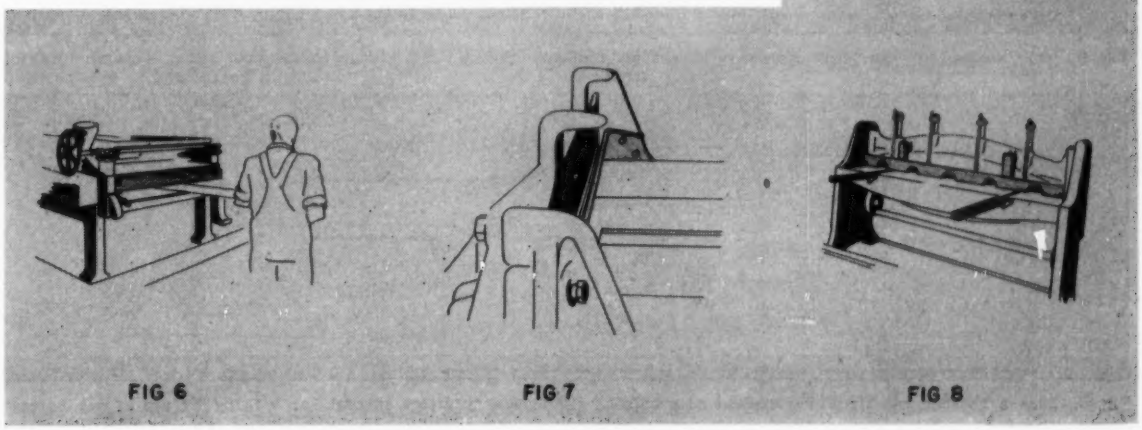


FIG 6 FIG 7 FIG 8

Roll guard on leveling machine, Fig. 6, consists of ¼ in. fiberboard. Other machine guards shown are: squaring shear guard, Fig. 7; stationary square shear guard, Fig. 8; and milling machine guards, Figs. 9 and 10. All add up to safety

DYNAMIC BRAKING For Small A-C Motors

By TOM M. GAYLE, Electrical Engineer

QUICK AND EFFECTIVE braking of small a-c motors finds a number of plant applications; the ability to completely stop motor rotation within a second or less is desirable in many operations. In practically all cases where a motor is used for any type of positioning control, braking is desired to make the positioning accurate and simple.

Small hoists, cranes, and truck lifts often depend on braking for dependable control. Operations involving pumping into vessels of low volume and filling small containers can often be improved by adding dynamic braking to the pump motor.

Braking can also be utilized on shop equipment to improve workmanship and prevent wasted material. A typical example is in the drilling of soft material. A broken drill and a ruined piece of work could often be prevented providing the motor could be stopped without coasting.

One simple and effective means of providing braking for small a-c motors is by application of direct current through the stator winding. The field thus created acts to magnetically retard and lock rotor movement. Figure 1 shows a simple method of providing the necessary direct current. A selenium rectifier is connected in one a-c lead for half wave operation. When the stop switch S_2, is actuated, the charge on capacitor C_1 as well as the direct current supplied by the rectifier is shunted through the motor. Approximately five amperes direct current will stop an 1800 rpm, ¼ hp induction motor in about ½ second.

Larger motors, of course, require proportionally larger supplies. If the motor is driving a high inertia load, more current will also be required to overcome the added inertia. If the motor is to be braked infrequently, the rectifier used need not be rated for the current actually drawn. Most selenium rectifiers are capable of many times their rated current for short intervals.

Capacitor C_1 should be at least 500 microfarad and preferably larger. The small size 200 v electrolytic types are inexpensive and quite adequate. If slower deceleration is desired or it is necessary to limit the current, a resistor R should be added to the circuit.

It will be found that some additional braking force can be obtained on motors equipped with centrifugal starting switches by applying direct current to both start and run windings. This requires wiring a lead around the centrifugal switch in order that the current may be applied across the start winding while at operating speed. In most cases, however, using the additional winding is not necessary as adequate braking can be realized by shunting high current through only one winding.

Figure 2 shows a simplified circuit using a dry battery to supply the direct current. Two standard 45 v B batteries connected in parallel will stop a ¼ hp induction motor in less than a second. Such a circuit works out well for those applications in which the braking is applied only rarely and current drain is correspondingly low. Under such conditions the batteries will normally last their shelf life of more than a year.

Some consideration should be given to the selection of switch S_2. If it is used for safety shutdown, its location and operating lever or pedal are of importance. A latching type switch should probably be used for this service so that the motor will remain inoperative until the switch is manually reset. A double throw switch provided with a dead center position is often useful in many safety applications. If the switch used for S_2 is small, a capacitor C_2, of about 0.5 microfarad can be used across it to reduce arcing when reopening.

In either of the circuits shown, a thermal or time cutout should be provided to break the direct current if the circuit through the motor is likely to be closed for longer than about thirty seconds. A properly rated slow blow type fuse in the circuit is an inexpensive means of supplying this feature for one time operation. A standard thermal overload relay would be more satisfactory for frequent operation.

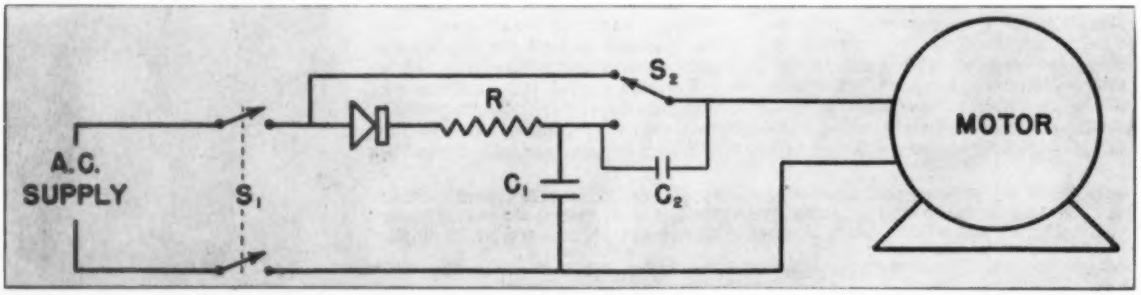


Fig. 1. One method of providing necessary direct current flow through the stator winding to effect dynamic braking

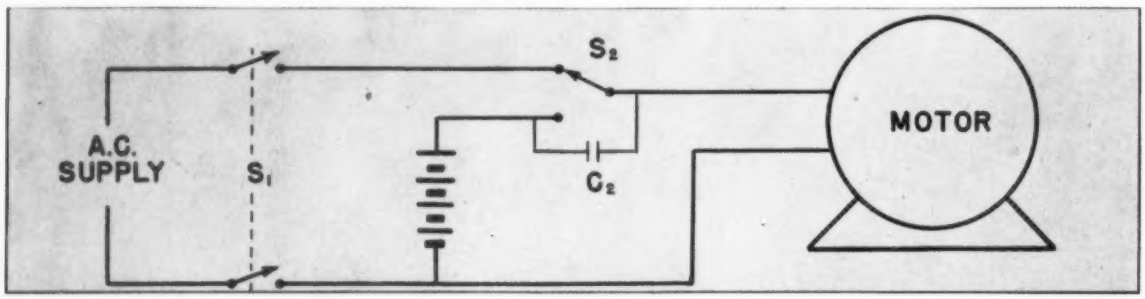


Fig. 2. This is another and simplified method of providing the necessary direct current for braking by use of dry battery

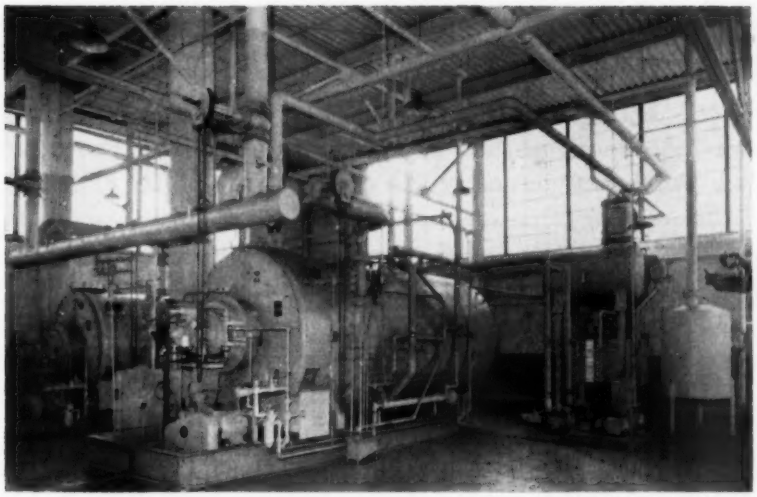


Photo: The Reliance Electric & Engineering Co.

Quick and Accurate PIPE SIZING CHARTS

Correct sizing of piping for steam supply and condensate return for heating systems is important if satisfactory and economical operation is to be expected

By WILLIAM W. GAYLORD, Consulting Engineer, Torrington, Conn.

THERE IS MUCH data available on the carrying capacities of pipe but most of it is in such form that its use is tedious or, at best, slow. The table of constants for use in the Babcock formula published in the ASHVE Guide give good results but require the use of four values for each length of pipe sized. There have been several alignment charts published on steam flow in pipes but all these require three or four operations for each length of pipe.

Tables Are Tough

Tables of pipe capacities, in either flow in pounds per hour or number of square feet of radiation supplied, have been published for various initial pressures and a series of pressure drops. To use these tables it is first necessary to choose the table nearest the expected working pressure; second, to choose the pressure drop that can be allowed per 100 ft of pipe; then, from the proper line in the table, select the pipe size required.

Pressure drop that can be allowed per 100 ft of pipe depends on the initial pressure and the length of run from the boiler to the most distant heating unit or radiator. Pressure drop from source—boiler or reducing valve—to the most distant heating unit in a low pressure system (under 15 lb) is 15 per cent to 20 per cent. For systems with pressure 25 lb and above it is 25 per cent to 30 per cent.

Thus, for a system operating at 10 psi with the equivalent length of the longest run 600 ft, the drop per 100 ft of pipe would be 2.5 per cent (15÷6) to 3.3 per cent (20÷6). For a 400 ft run it would be 3.75 per cent to 5.0 per cent. For pressure 25 lb or above, a 7.5 per cent pressure drop per 100 ft of pipe would be used up to 400 ft runs; 5 per cent pressure drop up to 600 ft runs; 3.75 per cent pressure drop up to 800 ft runs; and 2.5 per cent up to 1200 ft runs. Pressure drops above 5 per cent per 100 ft produce such high steam velocities that their use is seldom desirable.

If two or more operating pressures are to be compared in designing a system the use of the tables and charts mentioned above become rather tedious. For a quick method of determining the pipe sizes of any system, I have prepared and used charts showing the pounds of steam per hour that various commercial pipe sizes will deliver with pressure drops of 2.5 per cent, 3.75 per cent, and 5.0 per cent per hundred feet of pipe for pressure from 5 lb to 150 lb gage. I have also prepared a chart to show the condensate flow in pounds per hour for the different pipe sizes over the same pressure range.

Here's an Example

To illustrate the use of these charts assume a low pressure steam heating system is to be designed where the distance from the boiler to the most distant unit heater is 600 ft and the maximum flow in the main is 6000 lb per hr. The main will supply three branches, each of which takes 1500 lb per hour; runouts from the main and the branches to unit heaters each take 150 lb of steam per hour.

As the exact layout of piping, fittings, valves, etc, has not been determined the equivalent length of pipe to the last unit heater will be assumed as 1.25 times the actual length so this system will require the use of the 2.5 per cent pressure drop chart. It is designed to compare pipe sizes, let us say, for both 5 lb and 12.5 lb operating pressures.

As a second comparison let us assume a system at 40 psi operating pressure which will require the use of the 3.75 per cent pressure drop chart. Then, the pipe sizes will be as shown by Table I.

It is always desirable to maintain a uniform pressure drop, insofar as possible with commercially available pipe sizes, throughout the length of a system; sizing by the use of these charts make this much easier. It will usually be found that the total drop from the source to the last heating unit will be somewhat less than the percentage drop of the chart used inasmuch as most of the pipe sizes chosen will not be working at their full capacity.

For the charts referred to turn the page.

Table 1. Pipe size for our assumed heating system described in text of this article

Section	Steam Flow Pounds	5 Pounds		12.5 Pounds		40 Pounds	
		Supply	Return	Supply	Return	Supply	Return
Main to First Branch	6000	8"	4"	8"	3½"	5"	2½"
First to Second Branch	4500	8"	4"	6"	3"	4"	2½"
Second to Third Branch	3000	6"	3½"	5"	3"	3½"	2"
Third Branch to End	1500	5"	2½"	4"	2"	2½"	1½"
Runouts to Heaters	150	2"	1"	1½"	1"	1¼"	¾"

HANDY CHARTS FOR SIZING STEAM SUPPLY AND CONDENSATE RETURN PIPING

If you would like to have additional copies of these charts for loose-leaf insertion or hanging on the wall, write to us. Don't tear your copy; the next man might like to read it

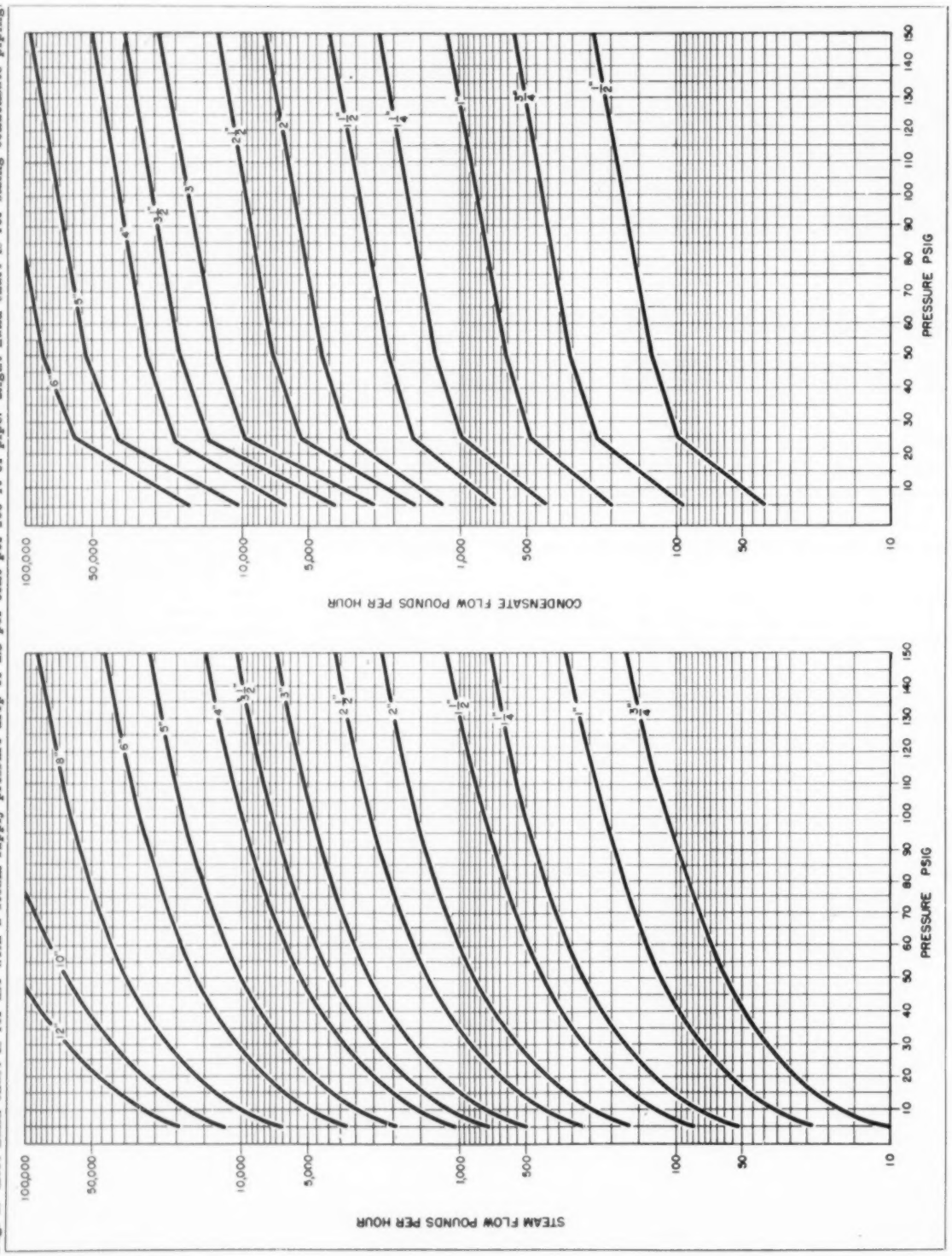


Fig. 1. Left hand chart is for use with a steam supply pressure drop of 2.5 per cent per 100 ft of pipe. Right hand chart is for sizing condensate piping.

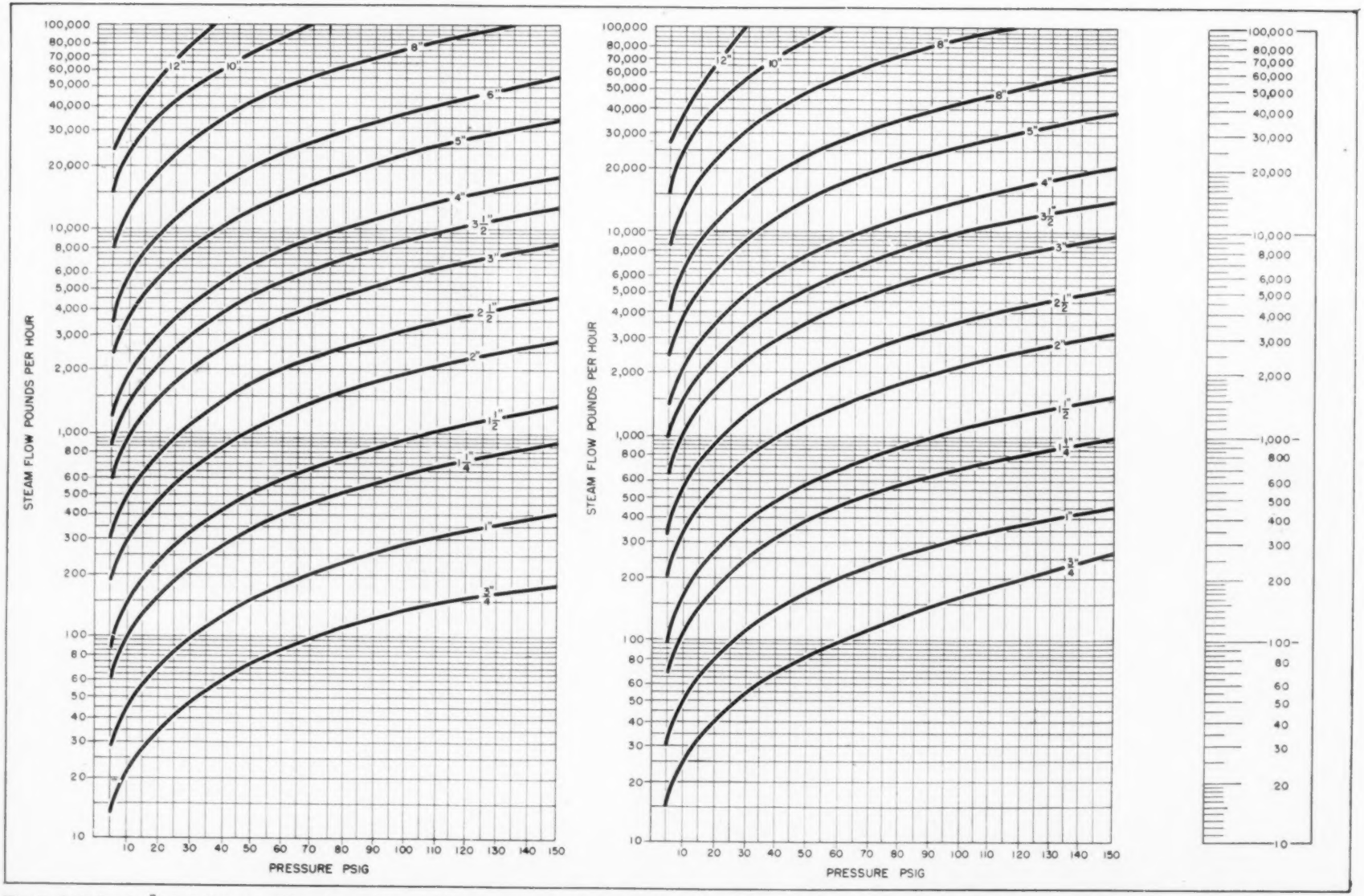


Fig. 2. Left hand chart is for use with pressure drop of 3.75 per cent per 100 ft. Right hand chart is for use when working with a pressure drop of 5.0 per cent per 100 ft

Fig. 1. With crude oil priced at $1.80 to $2.00 a barrel compared to $5.20 bbl for diesel oil, Union Oil is realizing a $36 a day saving by burning crude oil

Union Oil Co. is successfully operating six diesels at its Junction plant with crude oil . . . How they solved the filtration and heating problems should be of interest to other plants considering the use of heavy crude oil

Pumping Station Diesel Engines Perform On Diet of Heavy Crude Oil

SIX HUSKY DIESEL ENGINES—main workhorses at Union Oil Co. of California's Junction pumping plant—are thriving on an economical diet of heavy crude oil, the same oil that is coursing through lines they monitor.

With only a handful of crude-fueled diesels operating across the U. S., few have proved so continuously successful as at Union's Junction operation. The company's engineers spent nearly four years of research before putting the first crude-fueled diesel on a pump. Now Union has installed six in a single plant.

Economies, plant engineering-wise, are noteworthy. Where standard diesel fuel costs about $5.20 a barrel, crude is priced at about $1.80 to $2.00. Union currently saves nearly $36 a day since its engines consume approximately 12 bbl during a 24-hour run. Biggest factor in using crude was its availability and the pumping plant's isolation—nearly 70 miles from convenient diesel-fuel caches. But in using crude from its own lines, Union had to install extensive filtering to cope with the heavy 16 deg API oil.

In rigging diesel engines to consume such heavy fuel, Union had a choice of three crudes regularly pumped to the plant from various producing oil fields to the south. Normally crudes are pumped through the plant via one of three 8-in. outgoing lines which deliver the oil, unrefined, to a Pacific Coast marine loading terminal and to Union's San Francisco bay-area Oleum refinery.

The three types of oil available were:

(1) Heavy San Joaquin Valley crude—gravity 16 deg API; viscosity, 70 SSF at 122 F.

(2) San Joaquin Valley refining crude—gravity 20-24 deg API; viscosity, 220 SSU at 100 F.

(3) San Joaquin Valley waxy crude—gravity 32-36 deg API; viscosity 40 SSU at 100 F.

When Union decided to revamp its old Junction steam-operated plant, it compiled data on the three feasible types of power: steam, electric and diesel. Cost studies showed diesel engines to have a decided over-all advantage even though fuel would have to be trucked in. Dieselization

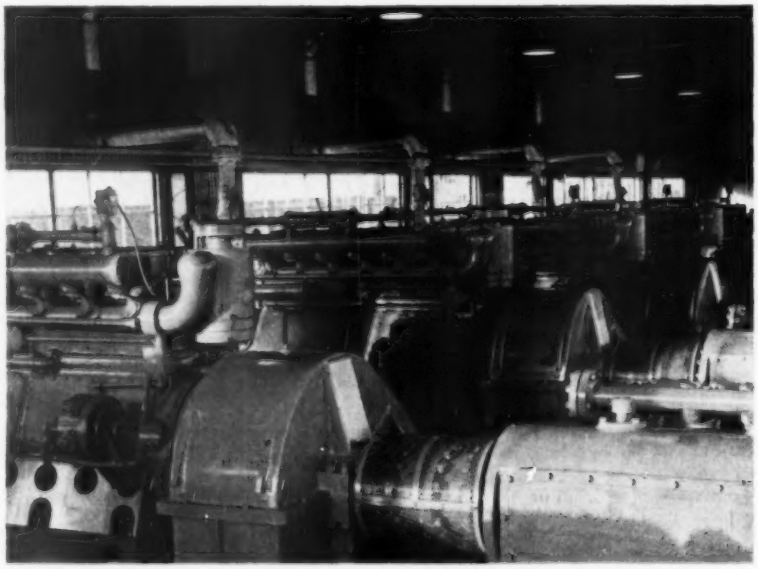


Fig. 2. Engine and pump layout at Union's Junction pumping plant. These six diesel engines are thriving on economical diet of the crude oil they monitor

would have even greater advantage if the engines could use line crude, readily available. Use of the 16 deg gravity crude as fuel was studied. It was found that at least a 60 per cent fuel-cost savings would be realized by putting diesels on crude.

Satisfactory Operation

Previously the company had installed a diesel engine layout at its Antelope plant (first station downstream from Junction) which burned crude-oil. Two years' satisfactory operation supported laboratory findings, and showed that diesel engines could handle crude with the following analysis:

Gravity, API	15.7
Flash point, F	178.0
Pour point, F	30.0
Viscosity:	
SSF at 70 F	1180
SSU at 100 F	2468
SSU at 130 F	763
Carbon residue, weight percentage	5.93
Ash content, weight percentage	0.04
Sulfur, weight percentage	1.15
Sediment and Water as rec'd, vol. percentage	1.00

From operations at the Antelope plant it was evident that crude would have to be carefully filtered and heated before allowing it to flow to the cylinder injector pumps.

Junction station installed a 1000 bbl crude fuel-oil tank and a smaller, 200 bbl tank for diesel fuel. Diesel oil is still burned during the first 15 minutes of an engine's warm-up and again during the last 15 minutes before closing it down. Should crude not be purged from the system, and should it cool, fuel lines and injector pumps would have to be dismantled and cleansed.

Heated and Filtered

The 1000 bbl crude-fuel tank pump-feeds the 200 bbl day tank. In the original set-up, crude flowed by gravity from the day tank through oversized lines to each engine. There it was heated in a jacket water system exchanger to 180 F. Hot crude, now more viscous, passed through a metal-edge filter in going to the suction of the engine fuel-oil pump. Crude discharged through an absorbent cloth-type filter before flowing to the individual cylinder injector pumps.

Currently being installed at Junction is a more comprehensive filtration system, similar to one already in use at the Antelope plant. This newer filter system rids crude of all foreign matter down to 5 microns.

Here's how the filtration set-up works: In series with the elevated day tank are four water-jacketed, cloth-packed filters. Heaters in the filters are supplied by the engines' water jacket systems, so manifolded that all six engines (if operating) contribute to filtering the oil.

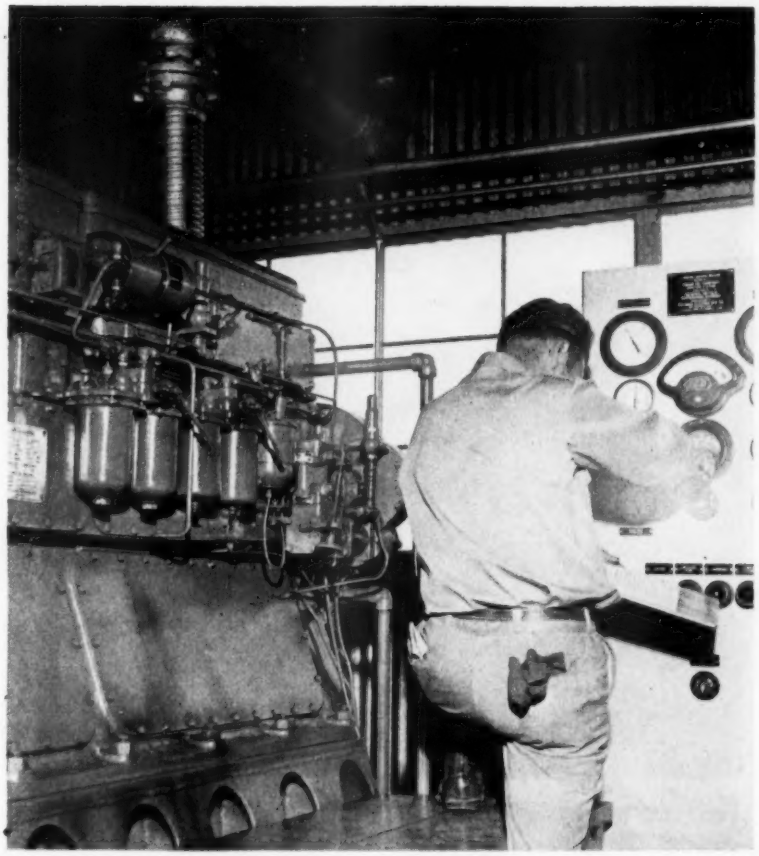


Fig. 3. Each diesel has its own control panel. Engine is warmed up for first and last 15 minutes of operation on standard diesel fuel to purge lines of crude oil

Initially (as the system first goes into operation) unfiltered crude from the outside 1000 bbl tank flows to the day tank and is pumped around the four filter circuit by a one hp electric-driven pump. The pump's rating is 20 gpm, although even when all diesels are operative, only about 2 gpm are burned. Thus, ten times as much crude is constantly and continuously filtered as is actually used. In short order the once unfiltered day tank crude has been cleansed of all but 0.1 per cent of its foreign matter—this from an original contamination of approximately three per cent.

The four heated filters are graduated from fine to very fine filtration. And finally, there are two super-fine filters at each engine—these remove particles down to 5 microns. Simultaneous with removal of particles, water is also separated from the crude, settling in the filters' bottoms. Each filter sump is blown-down once during an eight hour shift. Filter temperatures are maintained at about 160 F. via the engines' water jacket systems.

That filtration and heating problems were overcome, and that crude oil is successfully being used in the six diesels at the Junction pumping station, is important to the plant engineer. There are scores of plants whose diesel engines, either standby or in full-time use can, with a few modifications, be put on cheaper crude fuels.

Thus, diesel engines long used to burn a wide variety of fuels—from straight diesel oil to sewer gases—can operate just as successfully, and a good deal cheaper, on heavy crudes. The cost-savings, figured for engines in constant use, are considerable and there are likely many locations where crude is more readily available than refined oils.

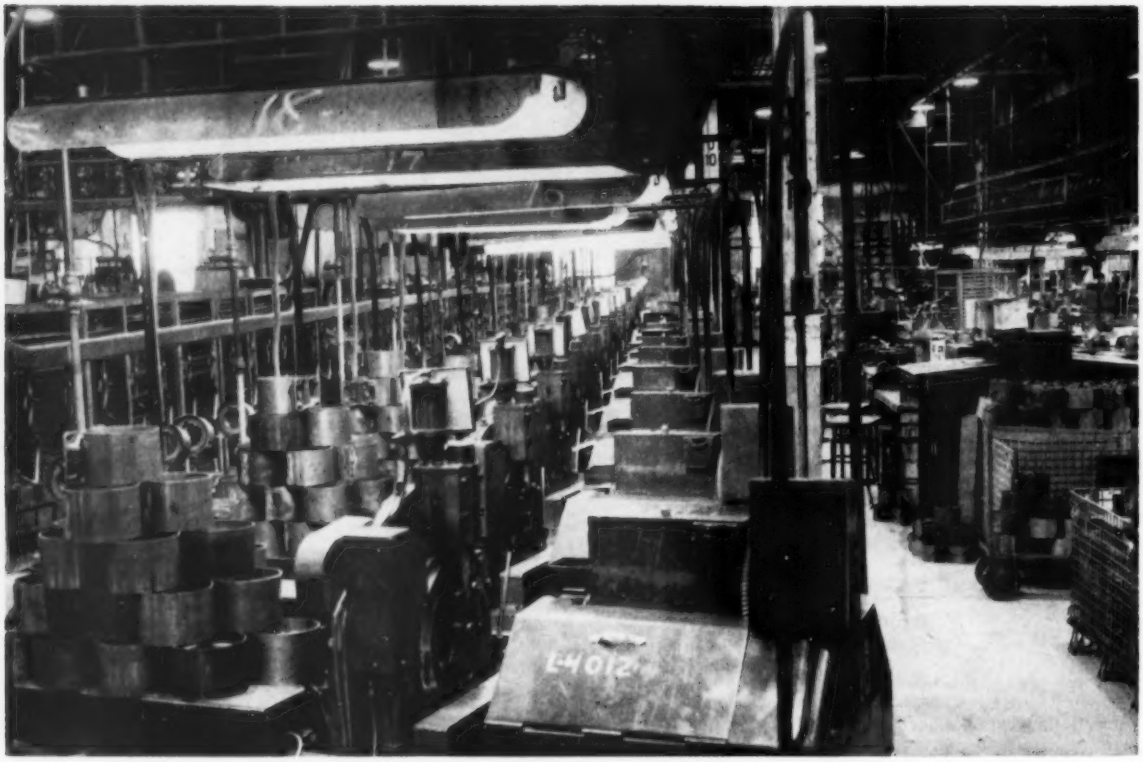


Fig. 1. Here are the eighteen winding machines (see MW on sketches) after they were moved into a straight line

EQUIPMENT REARRANGEMENT Saves $5000 First Year

Careful pre-planning of the job came first, followed by fast moves on a three-day holiday period. Machines were shifted, conveyors were moved, electrical hook-ups made with only a 10 per cent cut in production during the period

By I. E. SLAUER, Superintendent, Bellefontaine Plant, Small Motor Division, Westinghouse Electric Corp.

AT THE BELLEFONTAINE, Ohio, plant of the Westinghouse Small Motor Division, the operations are highly mechanized and conveyorized, with every operation being carefully screened periodically to see if new methods, materials, or handling equipment can improve it. As methods and new equipment were developed, layout changes eventually became necessary. The change involved a potential shutdown and it was essential that careful planning be exercised to insure minimum shutdown time.

Changes consisted of moving 173 ft of overhead conveyor and 33 machines. By careful planning, the change was completed in three days using two welders, nine maintenance men and three electricians.

Because of the move, more efficient use could be made of the equipment and 26 pieces of equipment were eliminated: two stator presses, two winders, three lathes and 19 wedging tables. Savings effected by improved material-handling will approximate $5000 the first year. Improved housekeeping is also possible because of more compact arrangement of equipment. In addition to these advantages, an area 10 ft by 160 ft is now available for other purposes.

Operations Flow

To get a picture of the operations it is necessary to describe briefly the general flow and handling of parts in the plant. There are over a mile and a quarter of Wilcox and Lamson conveyors and belts in the Bellefontaine plant, carrying all kinds of materials and parts from discharged scrap metal to completely fabricated parts going to the assembly operations. Each feeder section works to and from the overhead conveyors, which carry parts to the assembly area where they are assembled into motors ready for shipment. The conveyors are a vital highway in maintaining efficient production here.

At the Bellefontaine plant, the main winding in the motor has been wound on a machine developed for that purpose; but only recently has the second winding been attempted mechanically. The addition of the new equipment and the new methods they introduced created a situa-

tion that demanded a major move in layout and conveyors.

Proper timing of this move was vital to prevent a work furlough or disruption of the inventory of processed parts. To prevent this occurring, the following schedule was laid out:

1. A master plan of the plant layout to scale, with templates for all the equipment, was first developed.
2. The templates were moved to their new positions until the most efficient arrangement was made.
3. The manufacturing foremen were called in for their comments and suggestions.
4. The new layout was checked with the bus duct lines, air lines, girder supports, and aisles, to make most efficient use of the existing utility lines without making any major changes in the pipe fitting, etc.
5. The work schedule was planned in the sequence to be followed, so that sections could be done one at a time without interference to production in surrounding areas.
6. Work to be completed on overtime was laid out and an estimate was made of men and hours necessary to complete the job.

A survey was then made of the additional materials needed and the various shapes of conveyors that were going to have to be bent, formed and fitted into place.

After all the many details were worked out, the starting date for the changeover was selected. It was decided to start work on January 1, since it was a holiday.

"We can make them 40 per cent cheaper than our competitors. Now . . . if we only knew what they are."

On New Year's Eve the foreman consolidated the working groups as much as possible. This left several work areas free of people. The maintenance department immediately moved in, removed the benches, tables, materials, and machinery necessary to open the area for the portable welder. An electrician cut the conduit from the machines that were going to be moved in the changeover and were not in use.

On the following morning a conveyor to be eliminated was cut down and then cut into sections and into the form necessary for use in other parts of the plant. These cuts were all calculated in advance so as to save time on installation.

Winding machines and other equipment were numbered and moved into their newly assigned positions. Since the work had been planned well in advance, there was little confusion.

In the meantime, supports for the new conveyor positions were welded in place. Using block and tackle, each conveyor was supported from roof girders while it was cut for the new drops and bends. This saved time in raising and lowering parts.

When a piece was added to the conveyor, the welder was moved along on his platform and joined the bends and drops while they hung in suspension.

Two platforms for Graham variable-speed drives were made up and hoisted to the roof and welded into place. The electricians, meanwhile, had dropped new conduit and reconnected all the equipment that was moved. As far as possible, welding was done in areas where the maintenance crew had already finished, so they could continue their work without danger from hot sparks and falling slag.

By the end of the third day the move was completed, with the exception of cleaning up and moving materials back into place. On the fifth day, a Monday, while there was confusion due to the fact that some operators had to find new work stations, the loss in production was only 10 per cent of normal.

Fig. 2. This sketch shows distance of product travel "before"

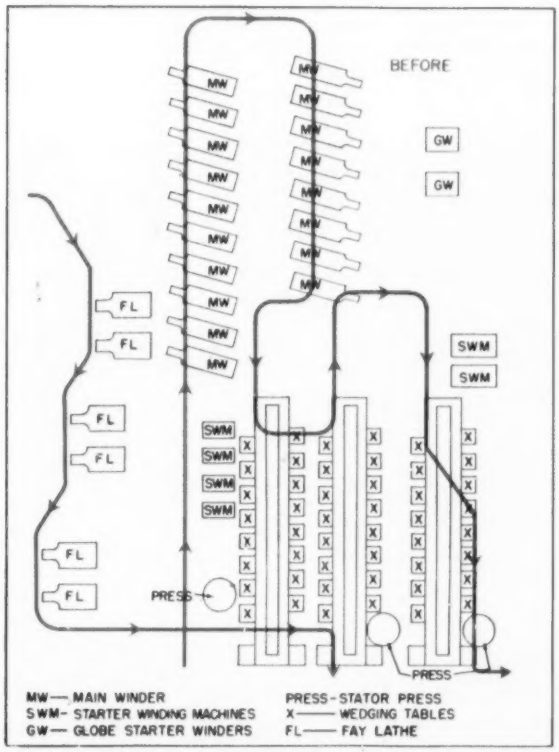
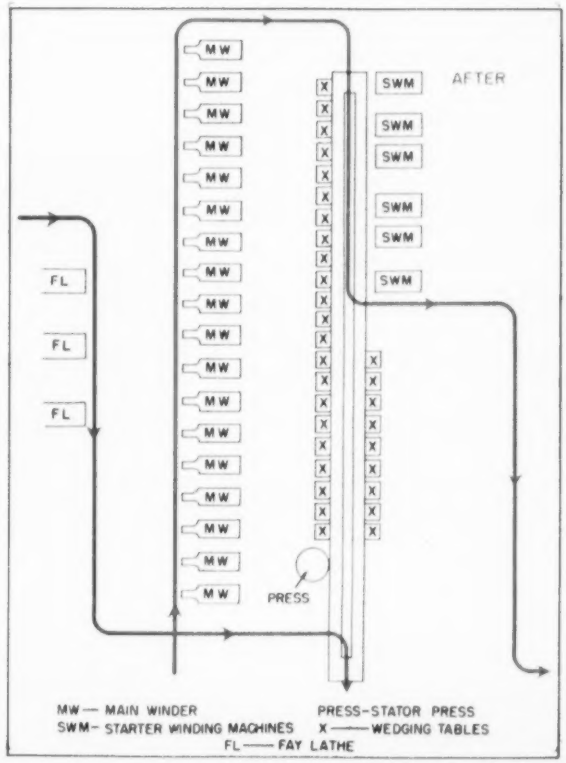


Fig. 3. This is the way the department looked "after"



Select the Oil Filter Designed for Your Operation

No one filter is likely to be able to remove every kind of contaminant found in oil, but you can select the most efficient design for your particular filtering equipment

USE OF FILTERS for lubricating oil, cutting oil, coolant systems and for the fluids in hydraulically operated equipment has become of particular importance in connection with the development of high speed machinery.

While it is improbable that any one filter is capable of removing solid particles, fibrous materials or gummy substances with equal efficiency, some designs are better than others for a given set of conditions. Consequently, when selecting a filter it is essential to know the proportionate amount of each kind of contaminant which is present, and the effect which each is likely to have on the operation of the equipment.

Following examples show results which are possible with proper selection of filters. For instance, a diesel engine manufacturer complained of too great a pressure drop through the filter used on the test stand. Also, the operating period of the filter between cleanings was too short.

Constant density cartridges were replaced with graded density cartridges. The surface of the graded cartridge, where the oil enters, is more porous and gradually becomes more dense toward the discharge surface. This prevents the material to be removed from accumulating on the outside and quickly building up a resistance to its flow. This type of cartridge is well suited to removing solids, gums and jelly-like materials encountered in this operation.

Increased Efficiency

The tests were being made on 800 hp diesel engines with SAE 40 lubricating oil, at operating temperatures between 160 and 180 F and a flow rate of 40 gpm. The new filter contained 32 cartridges with an inlet pressure of 15 psi and the pressure drop was 2 psi. With the previous filter this drop was 10 psi. The operating period, with the new filter, was increased from 150 to 175 hours, after which the oil was still in perfect condition. In addition the decreased load on the oil pump, which is driven from the engine, increased the over-all efficiency.

Another example of the advantages of using the right filter for a given job concerns an external grinding machine, shown in Fig. 1. There were scratches on the surface of the parts due to improper filtering of the coolant, which had to be changed every two days. Also, the grinding wheel had to be dressed after finishing each part.

With this operation, the method of coolant induction was changed to coolant-through-the-wheel, and the coolant was filtered to remove all abrasive and metal particles. A graded density type Cuno filter with nine 10-micron cartridges was installed to provide a relatively long and tortuous path to entrap the particles.

With the new filter and change in method of coolant induction, it was possible to grind up to 11 parts per wheel dressing with greatly improved finish. This resulted in a great reduction in wheel cost, diamond dresser cost and in time required for dressing. Futher savings were possible because of the infrequent changing of the coolant and cleaning of the coolant sump.

In another case, filters helped remove chips from hydraulic oil used to test automotive automatic transmissions. To accomplish this, each test stand was equipped with two single 25-micron cartridge filters. Circulating hydraulic oil is passed through the filters to remove chips which are picked up by the oil from the transmissions where they collected during the machining operations. The cartridges handle 5 to 7 gpm continuously for 16 hours per day and last about 200 hours, during which time they process over 30,000 gal of oil.

At the plant of Mechanics Universal Joint Div., Borg-Warner Corp., four quenching problems were solved in connection with heat treated steel parts which are later ground and finished. The first problem was to remove oxidized products from the oil and also to remove traces of moisture from it.

Centralized System

A central purification system was installed, consisting of two Honan-Crane multiple cartridge type filters, or purifiers, connected through a cooler to a 10,000 gal supply tank. Each purifier is equipped with a 10 gpm motor-driven pump. Pipe and valve layout is such that the purifiers can be used in series, parallel or individually.

Each of the heat treating machines has a quenching tank, and each tank is served by a separate 150 gpm motor-driven pump. With this arrangement oil is continuously circulated through the purifiers and tank. It is pumped into the quenching tanks when they are in use and

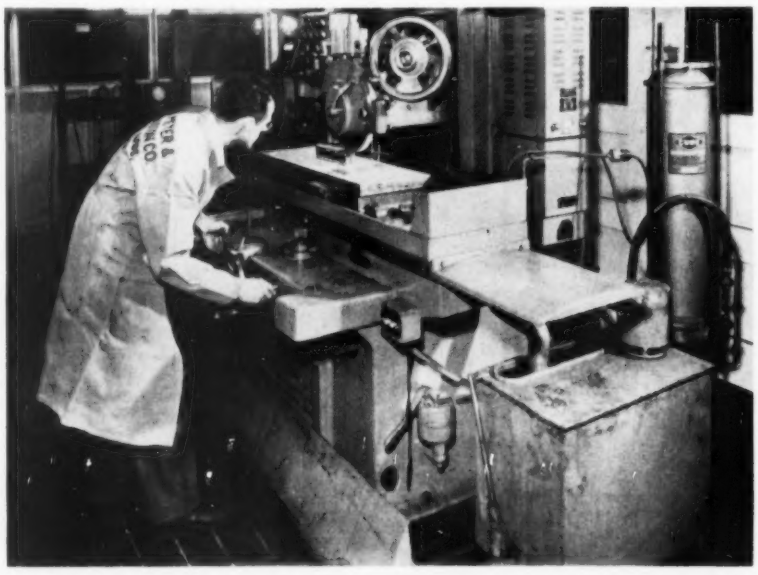


Fig. 1. External grinding machine equipped with filter prevents possible scratches on surface of parts previously caused by improper filtering of the coolant

the overflow runs back into the 10,000 gal supply tank. Thus, the quenching oil is kept clean at all times and there is no need of periodically cleaning the whole system. Most important of all, there is no danger of lack of uniformity of the product due to the use of contaminated oil.

The second problem was caused by oil dripping from the quench tank conveyors as the parts emerged from them. Drip tubs holding 40 gal were installed under the floor grating to catch the oil. Cleaning these twice a week required the service of three men for one hour. The oil was so dirty that it had to be thrown away. This oil, formerly wasted, is passed through a filter and returned to the quench tank free of contaminants. Now, one man cleans the three drip tubs in 45 minutes twice weekly, and 240 gal of oil are saved each week.

A third problem was encountered with reuse of coolant oil from eight machines performing multiple operations. Removal of foreign particles was accomplished by installing a specially-designed clarifier at each machine to remove chips, abrasives and other solid materials, using the pressure from the machine pumps. Important savings in oil and reduced maintenance costs have resulted, in addition to improved efficiency in finishing.

Purifier Pays for Self

The fourth problem consisted of cleaning the sumps of four centerless grinders and five washers. This is now done with one 125 gal Houdaille sump cleaner which pumps the soluble oil coolant and grindings from the sumps, Fig. 2, taking 5 minutes per sump.

An interesting case of a quenching oil purifier paying for itself in less than a year is to be found at the Cleveland Graphite Bronze Co. This is in connection with an operation where molten bearing alloy is poured on a very hot steel strip to form a bond between the two while quenching oil is sprayed against the strip. The products of oxidation formed in the oil caused deposits on the tubes and inner walls of water cooled heat exchangers in the oil line ahead of the spray nozzles. These deposits acted as insulation which interfered with the control of oil temperature, and it was necessary to shut down at least every four weeks to clean the exchangers and change the oil.

In addition to a loss of production time, the labor cost for this single operation was $100 plus $90 for the new oil.

After an unsuccessful attempt at filtering the oil with pre-coat filters, three continuous oil purifiers were installed ahead of the exchangers in the quenching oil system, Fig. 3. Each purifier has 20 adsorbent cartridges of processed fuller's earth. This installation made it possible to maintain constant oil temperature and eliminated cleaning the coolers and changing the oil for the first 18 months of operation.

Fig. 2. Sump cleaner, with 125 gal capacity, pumps coolant and grindings from sump in five minutes. Power for the pump is supplied by plug-in cable

In some large scale operations where quantities of coolant, cutting oil or flushing oil are required, a central filtering system may be used. A good example of this is a series of ten Nugent duplex pressure filter units to keep dirt out of the flushing oil in the manufacture of ball bearings. This system consists of a 6000 gal dirty oil reservoir and a 2000 gal filtered oil tank, plus pumping equipment to provide a filtering capacity of 2000 gpm.

A popular type of steam turbine lubricating oil filtering system uses both gravity and pressure filters to absorb moisture and thoroughly clean the oil of dirt and other foreign particles. The gravity filter may operate continuously since any one bag may be removed for cleaning independently of the other bags. Cleaning is necessary about every 300 hours and the life of the bags is about 4000 hours. The gravity filter is designed to give an automatic signal by ringing a bell or flashing a light when it needs cleaning. The pressure filter uses replaceable cartridges.

Gravity Type Filter

Another type of steam turbine lubricating oil filtering system uses only a gravity filter. In a 1000 kw installation which has given very satisfactory service, the base holds 72 gal of oil which is filtered at the rate of 12 gal per hour. The filter has an overflow alarm and a water separating device.

As is evident from the foregoing discussion, there are numerous types of filters for different conditions. Plant engineers, responsible for this important detail, will do well to consult with one or more of the reliable makers of filtering equipment to be sure that he gets the proper system for his requirements.

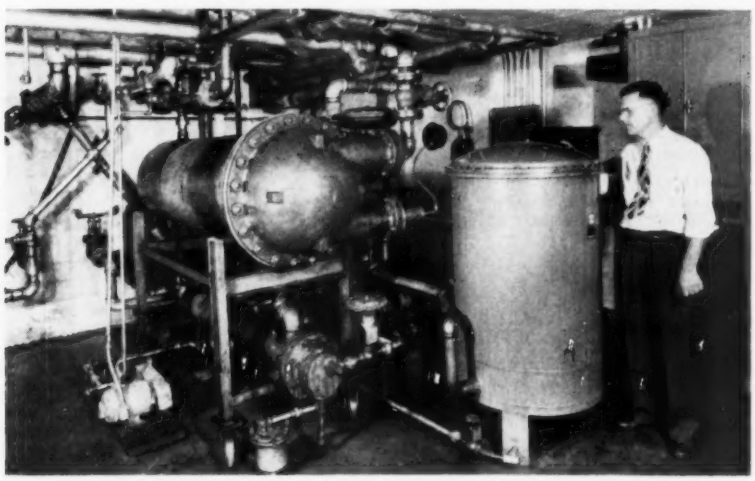


Fig. 3. One of the three oil purifiers installed ahead of the exchangers in this quenching oil system. Each purifier has 20 adsorbent cartridges of fuller's earth

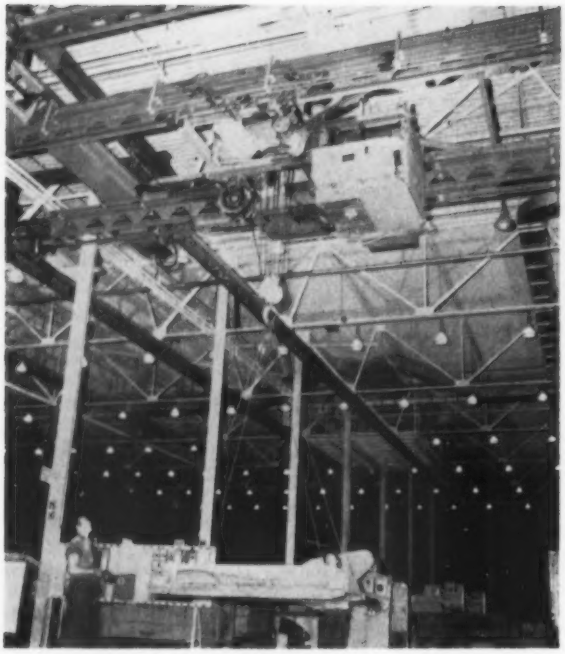


Fig. 1. This floor-operated bridge hoist is being maneuvered by the operators at one of the aisle switching stations

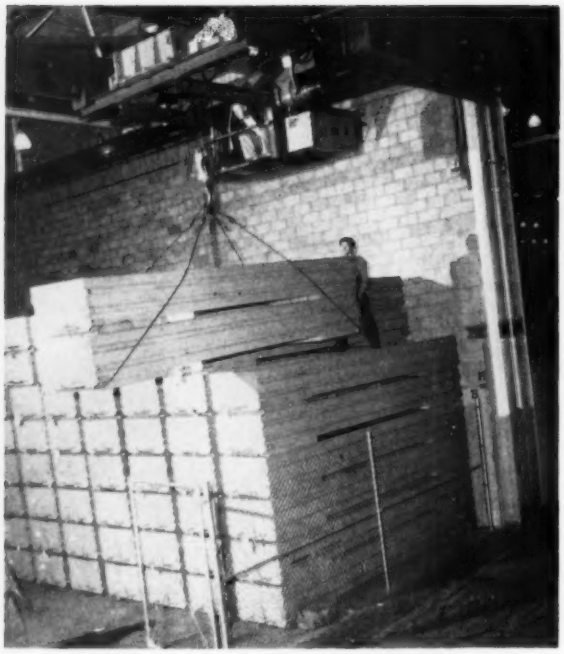


Fig. 2. Heavy steel storage boxes—an innovation at Douglas—are easily picked up by single overhead bridge crane

Four-Way Cranes Criss-Cross Douglas' Warehouse

ENGINEERED INTO Douglas Aircraft Company's 307,000 sq ft El Segundo, California, warehouse is one of the country's most all-encompassing craneway systems. Its very extensiveness—likely not matched in more than half a dozen U. S. plants—has helped to create aircraft's most efficient warehouse.

With complete overhead coverage, the craneways are one reason that the Douglas warehouse, a single-story, 960 by 320 ft structure, is directly responsible for supplying the plant's fabrication and production lines with everything from rivets to sheet aluminum.

Four Requirements

Douglas wanted and got a crane-system which would completely cover the warehouse's 16 bays, each 60 ft wide, and running back approximately 150 ft from a single center aisle. This order was complicated by several factors, among them firewalls which segregate the warehouse into four sections of four bays each. The firewalls' only openings are center-aisle, 20-ft wide portals. Even this access is guarded on both sides by heavy steel firedoors, which shut automatically in case of fire.

Douglas' craneway requirements demanded: (1) a system which would guarantee complete coverage from overhead; (2) a layout which would allow any one crane to travel the entire plant, bay-to-bay; (3) standardized bridge-cranes which could not only negotiate the 60-ft wide bays, but also move along the 20-ft wide aisles; (4) a system designed for "one-step" operation—with a bridge capable of hoisting a load in any corner of the plant and carrying it to any other without transferring the load.

Douglas got all this and more.

There are 12 bridge-type cranes in all. They vary in capacities from two to 7½ tons, the larger cranes are controlled from their cabs, the smaller from floor-operated pendants, see Figs. 1 and 2.

The 12 bridge-type cranes consist of:

- 4—2-ton (turntable) units, operated from the floor
- 4—7½-ton, one-hoist bridges, cab-operated
- 1—7½- and 4-ton, double-hoist units, cab-operated
- 3—2-ton, non-swiveling, floor-operated bridges, used mostly for intra-bay materials movement

Engineering-wise, a natural question is, "Why 12 bridges?" Economics played its decisive role here. Had the system involved interlocking cranes and spurs, many more bridges would have been necessary. However, roughly speaking, craneways cost but 20 cents a pound, while the bridge units themselves cost about 60 cents a pound. Thus, it was less expensive to have longer runs of tracks, hooked by turntable switches, Fig. 3, than an excessive number of bridges.

As installed, the system's 15-in. rails, weighing 44 lbs to the foot (top

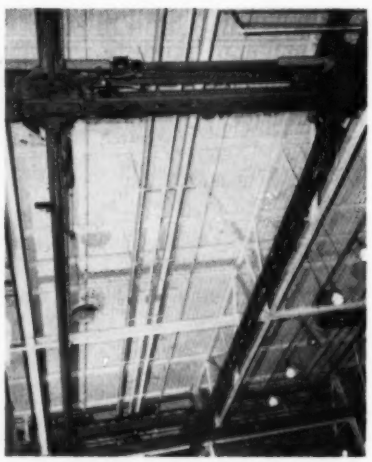


Fig. 3. Typical overhead switching station is shown at top of picture

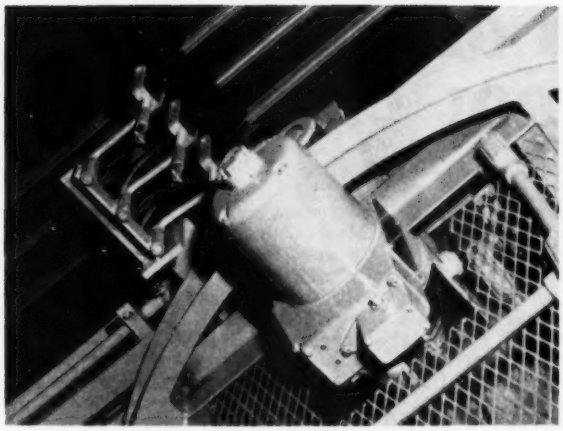


Fig. 4. Conduit bars are covered with molded plastic and nylon guards to comply with state's industrial safety code

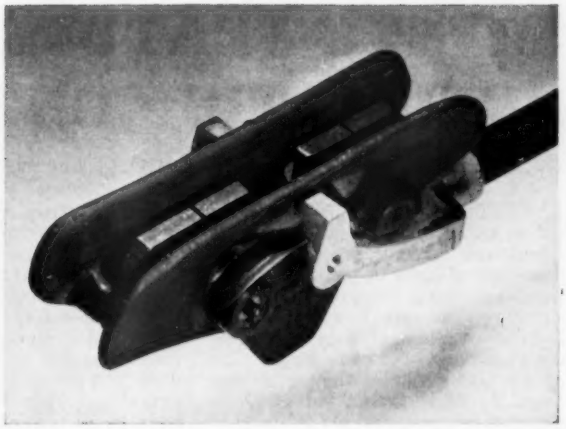


Fig. 5. Another safety covering, of U-shaped molded nylon, was designed to enclose the graphitic copper collector

flange: 8 in. wide, 1 in. thick; bottom flange: 3¼ x ⅝ in.), were rigidly fixed to the building's trusses. Trusses were drilled with lateral slots, while the rails were fabricated with longitudinal slots. These allowed for preliminary and final adjustment before the structures were bolted. Craneways were not designed to have any structural influence on the building's supports.

The craneways, designed and installed by the Whiting Corp., posed one problem which all but defeated engineering from the start. This was the California industrial safety code which requires that all exposed conduit be covered. The problem's solution led to a new concept of conduit guards.

Molded Plastic and Nylon

Covering for the craneways' conduits was accomplished by use of molded plastic and nylon guards, see Fig. 4. A U-shaped, polystyrene extrusion was molded to cover the galvanized steel, configurated conduit bar which carried 440 volts. Top and both sides of the down-hanging conduit were totally enclosed by the plastic shield. Only the bottom—the contact opening—was left unguarded.

A second safety covering, this time of molded nylon, and likewise U-shaped, was designed to enclose the graphitic copper collector. When these two—conductor and collector—were in contact, the conductor's plastic guard, flared somewhat at the bottom sides, overlapped the collector's. Thus, no conduit is exposed. This safety innovation has since been marketed for general plant use everywhere.

As engineered, the various bay laterals converged upon the center aisle's single longitudinal track. The problem here was to design bay-exit turntables which would be responsive to remote control, either energized from cab or floor push-buttons.

Here's how it was done: At each bay's convergence with the center-aisle trackage, there are four turntables. Thus, for sixteen bays, 64 turntables in all. The approximate 60-ft wide bridges leave the bays, hit the turntables, and move end-ways down the center aisle. In this position, bridges are but 15 to 20 ft wide, thus can negotiate the narrow aisle.

Each bay-exit turntable grouping breaks down into two pairs, individually powered by its own system of cables and a drive-motor. While mechanically the pairs are isolated, they are interconnected electrically so that the push of a control button switches all four turntables through a 90-deg turn, accomplishing the switch positioning.

One of the big troubles with some turntable designs is inherent play in cables. This is especially true where one cable controls all four turntables. The long cable length invites stretching, and means constant readjustment of cable lengths. However, readjustment is seldom necessary with the Douglas system, because cables control but two turntables simultaneously and are but 30 ft long. Besides, cables are anchored at four points along the two drums on which switch trackage is secured.

Turntable cables, ⅜-in. dia plow steel, control the units through a 90-deg turn. One ½ hp motor, synchronized with the motor controlling the adjacent pair of turntables, gives sufficient power. This is a considerably lighter motor than generally used for turntable motivation. Such a relatively small motor was possible because it activates only two turntables, instead of the usual four.

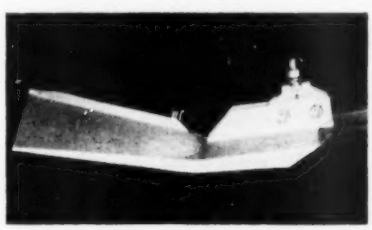


Fig. 6. Flared guide on control conductor properly positions collector automatically regardless of crane's speed

Center-aisle switching opened another problem: If two cranes were approaching the center aisle from opposite bays, which would control the switch?

As a bridge crane approaches a switch (and thus the center aisle), it picks up a special control bar. Until the bridge engages the bar, the operator has no electrical contact, thus no control over the switch. The switch bar, about 20 ft long, is located between 10 and 30 ft back from the switch. Cranes working farther back in the bays have no control whatever over switching. In fact, they aren't even in electrical contact with the turntables.

Admittedly, however, should two bridges pick up control bars simultaneously, from opposite bays, each would have equal control. Here, simple courtesy would determine which moved onto the turntables first.

Unique Guide

When you consider that a bridge may, on occasion, be moving at some 350 ft per minute, the impact of the pick-up could cause trouble. "Trouble" is prevented by a unique flared guide on the control conductor, Fig. 6. The guide properly positions the collector automatically, regardless of the crane's speed.

Bridges are powered by four, 2-hp motors (slip-ring type) mounted on the swivel end-trucks. One motor, installed on each of the four trucks, chain-drives a 10-in. dia solid rubber drive wheel. The drive wheel's bearing surface moves along the bottom surface (flange) of the rail. The crane's weight is borne by rail-hung wheels, bearing downward, which suspend individual trucks.

This craneway covers every corner — and every inch of — Douglas' new warehouse. And it's one of the most comprehensive installations among U. S. plants.

SAFETY FEATURES OF PNEUMATIC CONTROL CIRCUITS

By H. L. STEWART, Special Engineering, Logansport Machine Co., Inc.

SAFETY CONTROLS are a must on many air applications due to the nature of compressed air itself. Since air as used in pneumatic systems has been compressed six or eight atmospheres it expands very rapidly as it enters a cylinder and the piston moves at exceedingly high speeds unless its motion is slowed down by flow control valves. It is not uncommon for an air cylinder of 3 in. bore and 3 in. stroke to reciprocate 250 and 300 cycles per minute. With such rapidity the operator must be afforded some means of protection.

Since management is always confronted with the problem of providing safer working conditions for the employees, management must make sure that production machines employing air control systems are provided with safety interlocks whereever necessary. Although many applications do not require safety controls, the ones in which the operator may be exposed to a fast moving member of a die, fixture, ram, etc. must give adequate protection. The control system must be so designed that even the operator who might try to circumvent the safety feature cannot do so without stopping all machine motion.

In some instances it is necessary to design automatic stop valves into the circuit should the operating pressure drop below a safe operating range. In plants where there is not enough compressor capacity available to meet all of the air requirements—and this is not uncommon with the influx of air operated machines—safety controls should be built into air-operated clamping devices so that an excessive pressure drop will prevent the machines from operating. This can eliminate hazards to the operator as well as to provide safeguards to the workpiece and to the machine.

Safety interlocks on complicated machines using air as the motivating force, is of prime importance. If something should destroy the sequence of the machine, safety interlocks will immediately stop the machine. Safety interlocking valves may be solenoid operated, bleeder operated or pressure operated, depending upon the type of system used to control the actuation of the cylinders.

Filters and Lubricators

The author would like to point out one thing with regard to air circuits which is of prime importance but which is often overlooked; that is a provision for suitable filters and lubricators for the pneumatic system. After the air system is sold, the purchaser thinks only of control valves and cylinders. When mention is made of filters and lubricators he immediately states that he doesn't want to spend $40 or $50 extra for this equipment. Little does he know that it is the best insurance he can buy. Without filters and lubricators his air system may not fail immediately, but he can rest assured that it will fail in a short time.

Complaints are often registered by users of machines containing air system that are not getting satisfactory service from air components. In analyzing such complaints it is usually found that no filters or lubricators are in the system. The manufacturer did not put them in the system because it was likely he did not want to increase the cost of the machine, and when the purchaser received it he either did not realize the importance of the two items or did not want to make the additional expenditure.

Plant engineers can save a lot of headaches if they make sure that the proper filter and lubricator equipment is on each air-operated machine. These two items have a definite bearing on safety. Sticky valves, scored cylinder tubes and rods, due to the absence of filters and lubricators, do not lend themselves to any air circuit, especially a safety circuit.

The following safety circuits should be of help to plant engineers, designers and maintenance men in solving safety problems in their plants.

While most operators appreciate the safety device built into the machines on which they perform their daily task, some piece-workers invariably try short cuts which may endanger their lives. The air press safety control circuits are designed with the customary double controls in which the operator must keep both hands on the control lever during the downward stroke of the press. If he removes either hand the press ram will return to the starting position.

Since safety committees deal harshly with operators who try to circumvent a safety circuit, provisions are not made in many of these circuits to cope with the operator who ties down one of the controls so that he has a free hand which may get under the ram in his over anxiety to increase his production.

Circuit shown in Fig. 1 takes care of this hazard. If the operator removes either hand from the safety control valve, while the press ram is approaching the work, the ram will return. If he tries to tie down either safety control, the press ram will not return. In order to pro-

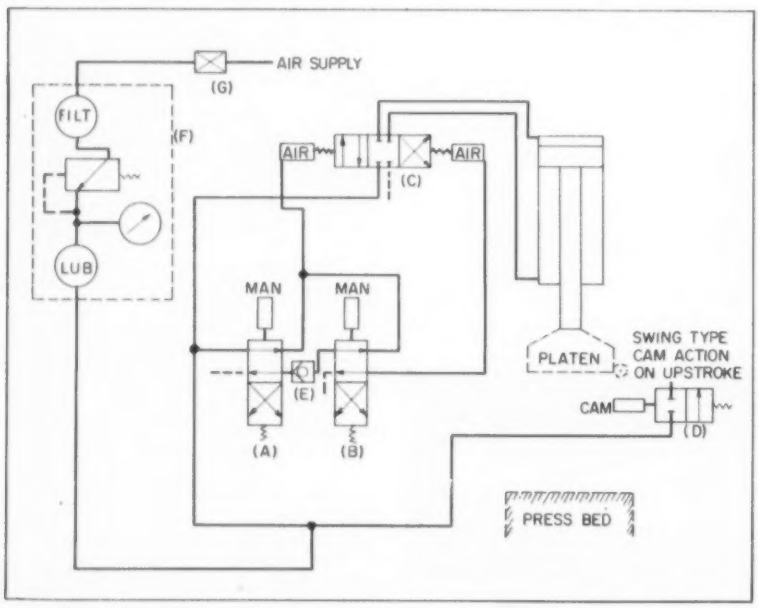


Fig. 1. This circuit arrangement prevents the operator from tying down one of the controls. Press will operate only when operator follows instructions

duce, he must operate the press according to instructions.

The circuit operates as follows: Operator loads small assembly into fixture on press bed and depresses handles on both small four-way spring return air control valves A and B. The air flows to the pilot connection of the three-position, closed center valve C, shifts spool in valve, allowing air to flow to blind end of press cylinder and ram descends at a rapid rate.

At completion of pressing cycle, operator releases both hands from valves A and B and press ram returns to original position. As it passes valve D the swing type cam contacts the roller on valve D, depressing it, and an air blast ejects the assembly into a chute at the rear of the press. Operator is ready to reload for next cycle.

Two hand air safety control circuits may also be designed with electric push button stations which operate the solenoid operated master control valves.

Protection for Workpiece

In order to afford ample protection to the workpiece during the clamping operations this dual pressure air circuit for clamping was constructed. The air operated fixture (power chuck) was designed so that the sleeve cylinder operates two jaws and the body cylinder operates the other two jaws of the four-jaw chuck. The sleeve section of the workpiece has a very thin wall so the clamping pressure on that section must be such that no distortion will take place while the body section is bulky and must take the heavy clamping pressure.

The system, Fig. 2, functions as follows: Cylinders No. 11 and No. 12 have their pistons in the retracted positions for the start of the cycle.

Operator then loads the workpiece into the chuck and momentarily depresses the clamp pushbutton switch, which energizes solenoid valves No. 15 and No. 22. Master valves No. 6 and No. 10 shift, exhausting unclamp sides of cylinders and applies low pressure to clamp side of body cylinder No. 12.

The body cylinder No. 12 actuates closing jaws which center workpiece at low operating pressure.

The pressure builds up in the line closing pressure switch No. 28 which is set at 20 psi, energizing solenoid valves No. 14 and No. 16, shifting master valve No. 6 for exhausting body cylinder and master valve No. 7 for applying high pressure to sleeve cylinder for locating sleeve.

When pressure builds up to 80 lb. switch closes, energizing solenoid valves No. 17 and No. 20, shifting master valve No. 7 and No. 9. High pressure on sleeve cylinder

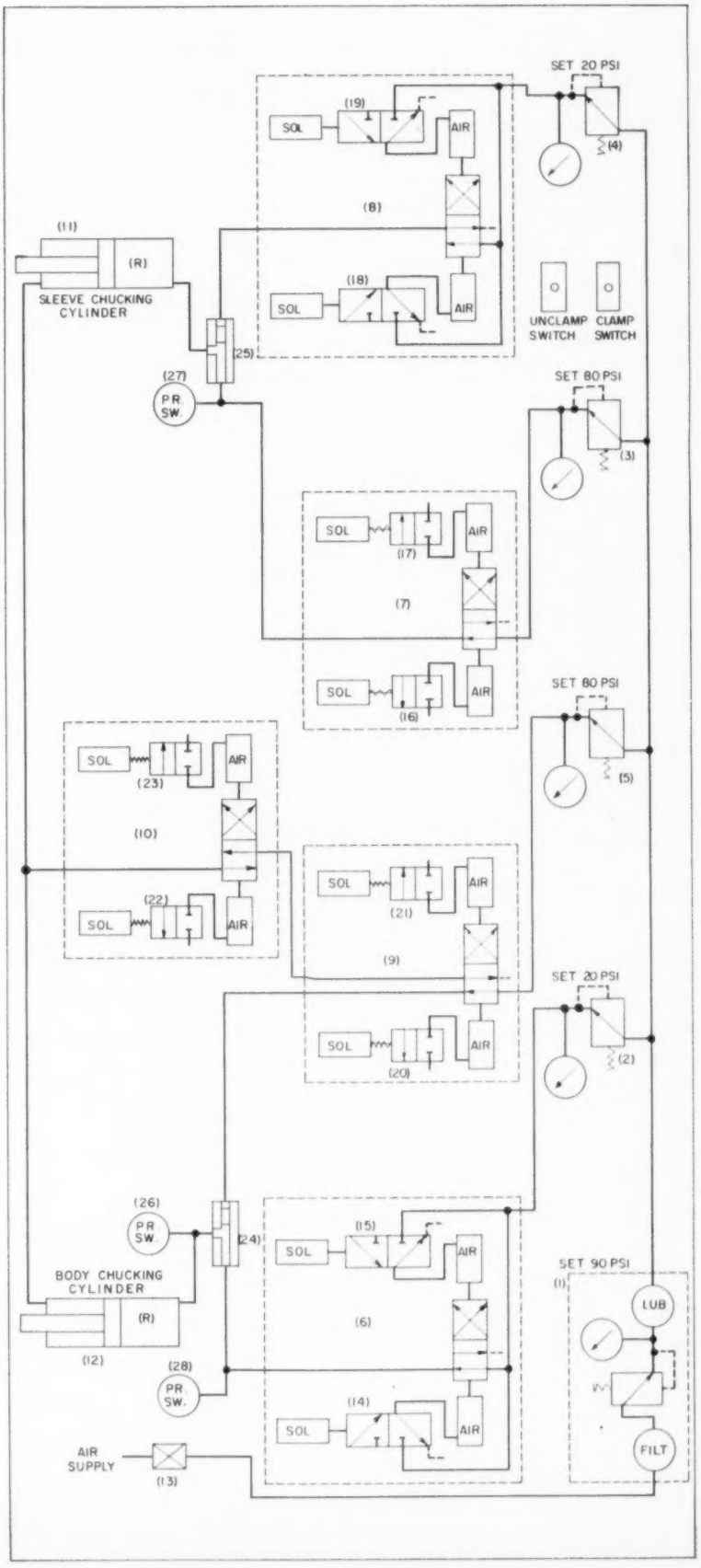


Fig. 2. Ample protection of the workpiece during clamping operations is possible with this pneumatic circuit

exhausts to eliminate distortion during operation through valve No. 7 and high pressure is applied to heavy section of body through valve No. 9.

Pressure build-up in body cylinder closes 80 lb pressure switch No. 26, energizing starter to lathe and solenoid valve No. 18, shifting valve No. 8, applying low pressure sleeve cylinder, completing first half of operation.

After machine work is complete, operator depresses the unclamp pushbutton station, which energizes solenoid valves No. 19, No. 21 and No. 23, shifting pistons of valves No. 8, No. 9 and No. 10, respectively. Pressure is applied to the unclamp side of sleeve cylinder No. 11 and body cylinder No. 12 which opens the fixture and releases the workpiece, completing the operating cycle.

This circuit, Fig. No. 3, is so designed that if operating pressure to the circuit should drop to approximately 40 lb, the operating cylinder piston will return to its original position. While this circuit sketch shows the application using pressure type control valves, it may also be accomplished by the use of bleeder operated type control valves. The safety control is the four-way, air pilot spring return valve D which automatically shifts when pressure drops below 40 lb.

The circuit functions as follows: Operator places workpiece on fixture and shifts valve A. This allows air to flow to port X of valve C, shifting piston of valve C which connects the inlet pressure of this valve to blind end of cylinder E. The piston moves out and the operation is performed.

Operator then depresses button valve B and air enters into port Y of valve C, shifting piston, causing air to flow to rod end of cylinder and returns piston to up position completing the cycle.

If air pressure should drop below 40 lb as the piston starts on its outstroke, the piston in valve D—which is normally depressed when pressure is in the system—is released causing low pressure air to flow out of cylinder port R of valve D through valve B into port Y of valve C, and master valve is shifted and piston of cylinder automatically returns.

This circuit is valuable in many forming, pressing, coining and other operations where protection must be afforded to the workpiece as well as the tooling. It also is a valuable part of an interlocking system where several operations are to be performed and where pressure drops must be eliminated. Several variations may be worked out.

For Mass Production

This type of press control circuit, Fig. 4, which is operated from electric push button controls, has numerous applications in mass production plants. The use of electrical controls saves space and eliminates considerable piping especially on large air presses. It is usually less expensive to install wiring than to install piping.

This circuit functions as follows: Operator depresses and holds both momentary contact push buttons, PB-1 and PB-2, closing the normally open contacts, energizing solenoid X of three-way valve R. This causes air to flow to pilot connection of four-way, three position, spring centered valve C, shifting valve piston directing air pressure to blind end of cylinder for outstroke. At end of cylinder outstroke, normally open limit switch LS-2 is closed, energizing electrical timer which closes.

Operator is now able to remove his hands from push button stations PB-1 and PB-2 as timer contacts now hold solenoid valve X energized, maintaining air pressure on pilot chamber of valve C which keeps air pressure on blind end of air cylinder. At the end of adjustable time-dwell the electrical timer opens, opening contacts which hold solenoid X energized and closes contact No. 2. Solenoid Y is now energized through timer contact No. 2 until limit switch LS-2 is released. The time resets, opening time contact No. 2. However, solenoid Y remains energized through normally open contacts of PB-1, PB-2, LS-1 and LS-2. Cylinder returns to retracted position or until limit switch LS-1 is opened. This breaks the current to solenoid X and piston of valve C returns to neutral position, blocking cylinder ports and stopping cylinder.

Operator then unloads work from press, completing cycle.

Many air control applications require the valving to be so designed that the operator can depress a push button and effect an immediate stop or an immediate return stroke on the air cylinder piston. If the operator notices that the workpiece is not in the correct location in the fixture, or it is not properly secured, or if some foreign object has fallen onto the working area, he should be able to stop action immediately whenever this occurs.

Circuit in Fig. 5 operates as follows: Operator loads work onto machine table. He then contacts start button. The cylinder automatically reciprocates as the limit switches make and break the contact, energizing alternately the solenoids of valves A and B which in turn bleed the ends of master control valve C, directing air to each end of the cylinder D as these limit switches are contacted.

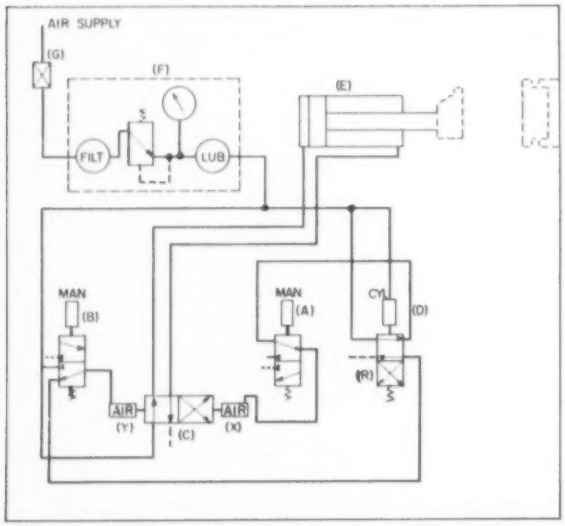


Fig. 3. If operating pressure should drop to 40 lb, cylinder piston in this circuit will return to original position

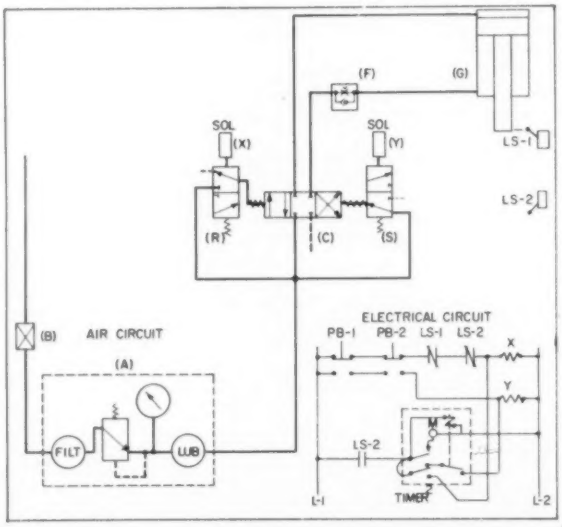


Fig. 4. Press control circuit, operated from electric push button controls, has numerous mass-production applications

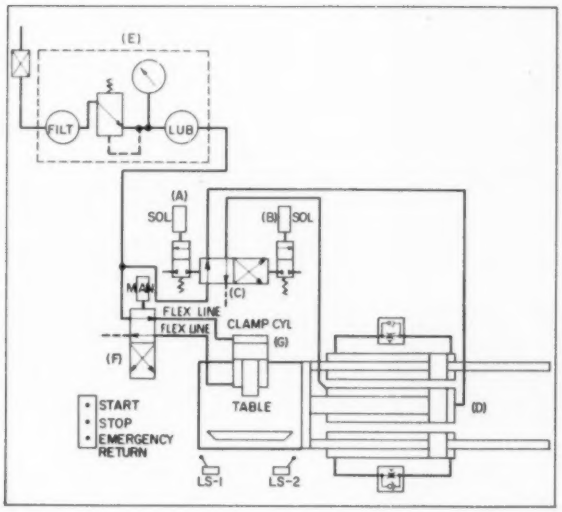


Fig. 5. Immediate stop or immediate return stroke on air cylinder piston is possible with controls on this circuit

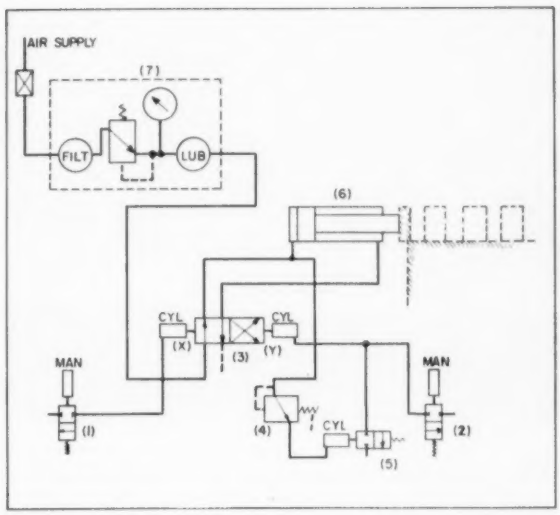


Fig. 6. Circuit is designed to eliminate an overload condition automatically, avoiding possible jam and damage to equipment

Operator contacts stop button, cylinder completes the stroke in progress and then stops. Operator unloads work and reloads.

If operator contacts emergency button during "feed" stroke, cylinder retracts at once to retracted position and then starts a new "feed" stroke.

If operator contacts both the stop and the emergency buttons, cylinder returns to retracted position and comes to rest at the point.

This circuit works well on grinding, milling, planing and other machine applications. The cylinder usually feeds slow on outstroke and has a rapid return stroke.

The circuit illustrated in Fig. 6 is designed to eliminate an overload condition automatically without the operator being charged with this responsibility.

This circuit functions as follows: Operator loads workpiece onto slide and shifts handle of three-way, two position bleeder valve No. 1 which bleeds pilot chamber of valve No. 3, shifting piston directing air to blind end of cylinder No. 6 and piston moves forward pushing workpiece along slide.

When workstroke is completed, operator shifts handle of valve No. 2 bleeding air from pilot chamber of valve No. 3, shifting piston, directing air to rod end of cylinder piston, and piston retracts to a starting position. Operator loads next workpiece.

If on the outstroke an overload is encountered, valve No. 4 opens, allowing air to flow to pilot connection of two-way valve No. 5. The piston in this valve is depressed, allowing air to bleed from pilot chamber of valve No. 3, thus directing air to rod end of cylinder and cylinder retracts.

The amount of load that can be exerted by the piston on the outstroke before the automatic reversal takes place depends upon the setting of the air sequence valve No. 4. This can be accurately set to meet the application. Automatic pressure reversals can also be designed into the circuit by the use of an electrically operated pressure switch and a solenoid operated master control valve.

This high-low chucking circuit, Fig. 7, while not as complicated as circuit in Fig. 2, has been used to advantage in chucking applications. While the one shown makes use of manually operated valves, it has also been worked out using solenoid operated valves.

This circuit can be used successfully to machine tubing which has a heavy wall at the start of the operation and must be gripped at high pressure, then as the heavy wall is machined away the pressure is substantially reduced for the finishing operation in order to eliminate distortion. It is not necessary to remove the piece from the chuck when pressure is changed.

The operator loads work into chucking fixture and shifts handle of valves A and B to position C and performs the heavy cutting operation. After this is completed, he shifts handle of valve A to position R and a light holding pressure is introduced. At the completion of second operation, operator shifts handle of valve A to position C and handle of valve B to position R, releasing the workpiece.

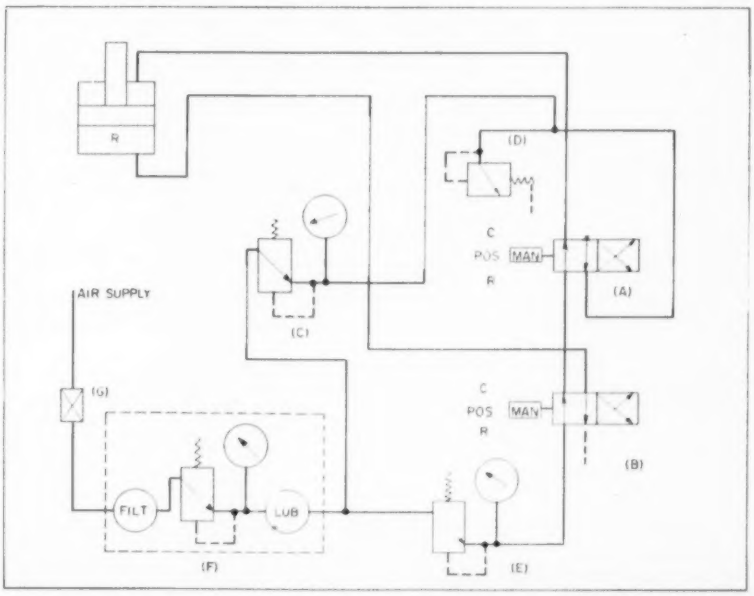


Fig. 7. High-low circuit is used for many chucking applications. While circuit shown uses manually operated valves, it can be operated with solenoid valves

Panel members at the afternoon audience participation panel discussion. The discussion leader in the middle is Thomas H. Nelson. At the morning session the four other members of the panel presented individual papers and in the evening led separate round table discussions. The large chart in the left background is a Manufacturing Cycle Chart referred to by Mr. Beardslee. It shows the time breakdown for each part and subassembly from the inception of an order to shipment of the product

Wayne University joins with Materials Handling Institute and the Detroit Board of Commerce to sponsor a one day, three session working conference on costs, controls, equipment, structures and methods of analysis involved in the

Economics of Materials Handling

By **RICHARD MORRIS**, Editorial Director

MANAGING the materials handling dollar was the theme of a one day conference sponsored by Wayne University, the Materials Handling Institute and the Detroit Board of Commerce. It was held on September 17 in the club rooms of the Engineering Society of Detroit. Attendance was limited to 200 material handlings management level specialists invited from the southeastern Michigan, northwestern Ohio and northern Indiana areas.

It was the first of a series of conferences which will be held in various sections of the country on different phases of the materials handling problem. Planned as a working conference, it struck a good balance between the various conference forms. In the morning four papers were presented. In the afternoon the four speakers, plus a discussion leader, held an audience participation panel based largely upon written questions. In the evening each speaker led separate round table discussion groups.

The main speakers shown in the photograph at the top of the page are: 1, E. C. Stephenson, vice president of Finance & Accounts of The J. L. Hudson Co., Detroit, Mich., who discussed Production Unit Accounting; 2, W. W. Beardslee, manager of the Manufacturing Engineering Service Department of the General Electric Co., Schenectady, N. Y., who told How Operating Management Evaluates Materials Handling; 3, Thomas H. Nelson, partner of Rogers, Slade & Hill of New York who directed the panel discussion in the afternoon; 4, John Drury Sheahan, partner of Drake, Startzman, Sheahan & Barclay of New York City, who discussed Control and Organization for Materials Handling; and 5, A. T. Waidelich, vice president and manager of the Research Division of the Austin Co., Cleveland, O., who discussed the Economics of Material Handling from the Viewpoint of the Analysis and Justification of Capital Expenditures.

The following pages cover certain portions of the four main papers with no attempt to list the committee members who handled the details so capably nor the local and national celebrities who added wit and sparkle to the occasion during the opening ceremonies, lunch and dinner.

Total Direct Labor	377	$1 131 000
Direct (Material Handling) Labor	267.4	802 200
Actual Direct Labor	109.6	$ 328 800
Indirect Material Handling Labor	69	$ 207 000
Direct (Material Handling) Labor	267.4	802 200
Actual Material Handling Labor	336.4	$1 009 200
Amortizing Charges		17 772
Maintenance & Repair Charges		6 825
Total Material Handling Charges		$1 033 797

Table I. Total materials handling costs summarized from Table II, equals 12 per cent of the plant output at manufacturing costs. About two-thirds of the direct labor cost is devoted to handling operations, a point often overlooked

How Operating Management Evaluates MH

By **W. W. Beardslee**

NATURALLY, an operating manager must first know his true material handling cost before he can intelligently evaluate any kind of a proposal affecting it from an economic standpoint. Up to the present time, determining this cost with any degree of accuracy has been one of the chief problems connected with the subject. We have found, though, that it can be determined if three factors are really known. These are:

1. What are the material handling charges in terms of dollars?
2. What segment of the business will show the greatest return from investments in material handling of equipment?
3. What is the manufacturing cycle in terms of time?

First, determining the amount of money that an operation is spending in handling materials is an engineering assignment which an accountant is not trained to perform. An example of a specific study of this kind is shown by Tables I and II. As a result of this system, we were able to determine that the ma-

terial handling costs connected with one of our product lines were $1,033,797, or 12 per cent of the plant output at manufacturing cost. This is a modern well operated line operation.

Second, is to take a look at our business to determine the selected areas where it would be most beneficial to accomplish cost reductions through investments in materials handling equipment. For this purpose our technique is to plot what we call a Product Cost Distribution Curve by charting the per cent of dollars billed against the percentage of products. For one typical General Electric business 80 per cent of the billing is derived from about 15 per cent of the individual products produced in the business. We have made these curves for many different businesses and find that the same general pattern or shape of curve exists for each. Again, from a study of the individual parts and sub-assemblies we find that 80 per cent of the cost is involved in 15 per cent of the component parts.

Results of the above analysis pinpoint the individual products and the individual parts and sub-assemblies within these products that represent 80 per cent of the billings of the products lines comprising the business. What this analysis does is to break your business down into its two logical groups; one, the small-variety, high-volume items; two, the large-variety, low-volume items.

The next obvious step, then, is to mechanize the high-volume items with an "in-line" product layout. The low-volume items, on the other hand, should be produced only in a "functional" type layout where all work of a common nature is done in one area. Thus, this technique helps us identify the area of the business where the greatest return will be gained from investments in all forms of cost reduction equipment.

Third, let's consider costs in terms of time for time is money in any manufacturing operation. While I have heard many figures quoted for the cost of carrying inventory, I believe that about 10 per cent of the original cost of the inventory is a commonly accepted figure for annual carrying cost. While this figure varies slightly between businesses, it's a good average figure to use.

The staggering costs of carrying inventory are ever present in the mind of the operating manager, and General Electric has spent considerable effort in studying ways and means of increasing inventory turnover. The construction of a Manufacturing Cycle Chart is the most effective means of accomplishing this end.

The Manufacturing Cycle Chart is a graphical presentation of what occurs in the factory in the production of a product. Activities are shown in actual sequence, plotted against a time scale. Thus we know, for each part and sub-assembly as well as for final assembly, test, inspect, pack and ship operation, the amount of time required to actually perform the operation and the amount of time that the part (or sub-assembly) remains idle between operations. It is interesting to note that the waiting or idle time far exceeds the making time.

We have found the powered conveyors are just about the most effective device we can employ to control the amount of inventory between operations. I am of the opinion that this feature of controlling inventory is at least as important a contribution of the conveyor as the feature of moving the material from one spot to another where needed.

Table II. A complete summary of material handling cost for good production line operation where the total is 12 percent

Expense Item	Units	Amortizing Dollars	Indirect Labor		Direct Labor					Maintenance and Repair Dollars	Total Material Handling Dollars
			Operators	Dollars	Operators	Dollars	% Material Handling	Material Handling People	Dollars		
"A" RECEIVE - STORE - DELIVER TO 1st OPERATION											
1. Tote Boxes	300									$ 750	$ 750
2. Fork Lift Truck	2	$ 2 045								600	2 645
3. Pallet Trucks (Powered)	6	1 362								1 800	3 162
4. Panel Trucks (Incl. Jeep)	2	560								240	800
5. Plywood-Expendable boxes	250	2 000								-	2 000
6. Materials Handlers			15	$ 45 000							45 000
7. Receiving Clerks			2	6 000							6 000
8. Truck Drivers			1	3 000							3 000
9. Inspectors			2	6 000							6 000
10. Stock Accumulators (Expediters)			7	21 000							21 000
"B" PROCESS - INSPECT - STORE - DELIVER TO ASSEMBLY											
1. Tote Boxes	125	-								300	300
2. Pallet Trucks (Hand)	4	375								300	675
3. Material Handlers			5	15 000							15 000
4. Inspectors			11	33 000							33 000
5. Elevator Operator			1	3 000							3 000
6. Stock Keepers			4	12 000							12 000
7. Ball Bearing					24	$ 72 000	62%	14.9	$ 44 700		44 700
8. Plating & Polishing					40	120 000	89	35.6	106 800		106 800
9. Foundry Machine Shop					31	93 000	62	19.2	57 600		57 600
10. Punch Press					34	102 000	69	23.5	70 500		70 500
11. Painting					8	24 000	77	6.2	18 600		18 600
12. Drill Press					15	45 000	59	8.9	26 700		26 700
13. Auto. Screw Machine					11	33 000	20	2.2	6 600		6 600
"C" ASSEMBLE - INSPECT - STORE - DELIVER TO SHIPPING											
1. Tote Boxes	10									25	25
2. Belt Conveyors	9	2 300								300	2 600
3. Gravity Roller Conv.	6									25	25
4. Overhead Monorail Conveyor	7	8 900								2 100	11 000
5. Inspectors			8	24 000							24 000
6. Fields & Armature					72.5	217 500	68	49.3	147 900		147 900
7. Motor Assembly					46.5	139 500	66	30.7	92 100		92 100
8. Vacuum Cleaner Assembly					43	129 000	84	36.0	108 000		108 000
9. Bag Assembly & Printing					16	48 000	53	8.5	25 500		25 500
10. Packing					36	108 000	90	32.4	97 200		97 200
"D" SHIPPING											
1. Tote Boxes	10	-								25	25
2. Fork Lift Truck	1	230								300	530
3. Belt Conveyors	1	-								35	35
4. Gravity Roller Conveyor	1	-								25	25
5. Shipping Clerks			10	30 000							30 000
6. Truck Driver			1	3 000							3 000
7. Warehousemen			2	6 000							6 000
		$17 772	69	$207 000	377.0	$1 131 000		267.4	$802 200	$6 825	$1 033 797

Control and Organization for MH

By J. D. Sheahan

SEPARATE systems of control for materials handling is not necessary. It is necessary that the materials handling control be integrated into your present system and that organization for materials handling be integrated into your organizational structure. The objective in a materials handling organization is the same as in any other function: Coordination and direction of line and staff materials handling specialists, and of materials handling operations in all your plants and warehouses.

One essential in any operation is the formulation and implementation of a warehouse reporting system. This is the report you cannot do without. The report should be prepared monthly by each installation. It should be analyzed and interpreted at the company headquarters. A consolidated report and analysis should be published to all levels of management. The reporting of four types of data is recommended. I think it wise to be specific and detailed on this point because experience demonstrates that most large companies can profitably institute this report with only minor modifications.

We begin with space. We want to know the area available and how it is allocated. The report should show the total area, then how much of that is used for storage and how much for other activities. Of the warehousing area, it should show how much is unusuable because of obstructions like columns and elevators, how much is in aisles, and how much is allocated to receiving, packing, shipping, and similar operations. All measurements should be actual, not estimated. You will also want to know the extent to which storage space is utilized, and the report should provide for the percentage occupied and percentage vacant.

The second type of data is equipment, both for materials handling and over-the-road trucks. The number of pieces of each major classification of equipment should be reported, the number and period of time out of service, and the operating costs for fuel or power and for maintenance.

Third, personnel. The report should show the number of employees, hourly rate, and straight and overtime man-hours by such categories as foremen, assistant foremen, warehousemen, lift truck operators, packers, and maintenance men.

Fourth, production. The quantities of materials received and shipped, in appropriate units such as pieces or pounds, should be reported. You may want to include productivity rates, such as the pounds handled per man-hour, derived from the production and personnel data, or you may prefer to develop those in the central office.

The report is no problem to prepare, with one exception: It will take careful guidance to insure that the data on space occupancy is accurate and consistent. There is no figure on the report that has more psychological potential than this one.

Table III. Cost comparisons of old and new facilities should always consider both present and future requirements and all the cost factors

	150 % VOLUME		100 % VOLUME	
	EXPANDED OLD WHSE	NEW WHSE	EXPANDED OLD WHSE	NEW WHSE
CAPITAL INVESTMENT				
NEW BUILDING, LAND, EQUIPMENT	$ 220,000	$ 800,000	$ 220,000	$ 800,000
SALE OF OLD WAREHOUSE		- 340,000		- 340,000
	$ 220,000	$ 460,000	$ 220,000	$ 460,000
INCREASED INVESTMENT		$ 240,000		$ 240,000
COMPARISON OF ANNUAL COSTS				
DEPRECIATION	$ 16,500	$ 20,000	$ 16,500	$ 20,000
MAINTENANCE & REPAIRS	33,000	17,000	29,500	15,000
TAXES	4,800	8,000	4,800	8,000
HEAT	5,000	3,000	5,000	3,000
POWER & LIGHT	5,000	4,500	4,000	4,000
LABOR	184,800	98,000	114,000	77,000
	$ 249,100	$ 150,500	$ 173,800	$ 127,000
ANTICIPATED ANNUAL SAVINGS				
BEFORE TAXES		$ 98,600		$ 46,800
AFTER TAXES		$ 47,300		$ 22,500
RETURN ON INCREASED INVESTMENT				
BEFORE TAXES		41.0 %		19.5 %
AFTER TAXES		19.7 %		9.4 %

The Analysis of Capital Expenditures

By A. T. Waidelich

CERTAINLY the approval of capital expenditures, for a new plant or warehouse, or the modernization of an existing facility is a top management function. Few such expenditures are made that do not include improved material handling as one of the important objectives.

The basic problem presented by new plants is how to compare two quite different facilities, with only a part of the expenditure chargeable to improved material handling, and no very accurate means of isolating the resulting costs of savings. A preferred way of doing this is to estimate the return on the increased investment. An analysis of this kind was made for replacing an existing four-story warehouse with a new one-story warehouse.

The old warehouse had a gross area of 85,000 sq ft; the new warehouse has 100,000 sq ft. In designing and equipping the new warehouse, full consideration was given to efficient handling and storage and it was anticipated that the labor costs would be reduced nearly one-half. The costs for the volume at the time the study was made showed a return on the increased investment, before income taxes, estimated at 8.6 per cent; after taxes at 4.1 per cent or hardly justification for this expenditure.

However, this comparison is biased in that it compares warehouses with quite different capacities. The new warehouse has storage area and facilities that will easily handle 50 per cent more volume than the old warehouse. This brings up one of the important aspects of justifying the replacement of old plants by new plants. The new plant will invariably cost more than the one it replaces, partly because building and equipment costs are higher, partly because no one will be satisfied with a new plant that isn't better than the old one, and partly because it is a rare case when the new plant will not accommodate a considerable expansion of business.

This intent should be recognized in the analysis. Let us recognize that a management objective is a

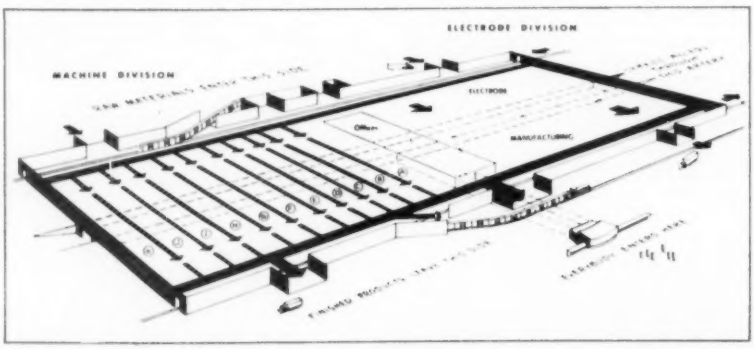


Fig. 1. Designed to cut indirect costs this Factory in a Stock Room uses a pallet type power conveyor with which to move material in the direction of flow

50 per cent increase in business in the near future. Since the present warehouse cannot handle that increase, what are the alternatives?

A new warehouse is one choice. But, in this case, there is another choice provided by a vacant lot adjacent to the present warehouse. This lot will accommodate a 4-story addition of 24,000 sq ft. This additional space, plus another elevator and an extension of their truck dock, will do an adequate job.

Now the comparison looks like as in Table III. On the basis of the planned 50 per cent increase in volume, the investment in the warehouse yields an attractive return, even after present taxes. The comparison on the 100 per cent volume was made to show the range of return while the business increased from the present volume, and also to indicate the effect of an unplanned recession in business.

To illustrate some of the points we discussed, I would like to use some examples of modern industrial and commercial facilities, in which improved material handling was an important objective.

F. & R. Lazarus & Co. wanted a new bulk service warehouse for their department store in Columbus, Ohio. Study of their old operations, item by item, revealed the opportunity to design a warehouse with over a quarter million square feet, in which most of the merchandise, from receipt to delivery, would move about 300 ft. This was accomplished by three decisions illustrated by Fig. 2:

1. Use of a long, narrow building plan. The receiving and shipping areas are along the length on opposite sides of the building. Between them is the storage area, only 200 ft in width.

2. Use of a mezzanine in the storage area. This mezzanine divides the building vertically into two 10-ft sections and permits full use of the cubage.

3. By having incoming merchandise delivered immediately adjacent to its point of storage. This was one of the most effective means used to reduce handling and movement. It was noted that most incoming deliveries were carloads or truckloads of similar merchandise, items which would all be stored in the same area.

Another unusual feature of this warehouse is that the mezzanine is open along its complete length. There are no elevators and merchandise to be stored on the mezzanine is placed on wheeled floats, which are raised by fork lift trucks. Complete flexibility in allocating storage areas was a necessity and was secured with adjustable shelving and the use of lift trucks and floats pulled by tractors. In certain areas, where fixed paths of movement were desirable—as in the carpet storage and workroom area—roller conveyors and monorails with electric hoists were used.

Another example is Lincoln Electric's new 20-a plant just east of Cleveland. This 8-½ million dollar plant shown in plan view by Fig. 1 was built for just one purpose: to reduce material handling costs. The result has been referred to as A Stock Room with a Built-in Factory. The building has columns spaced 60 ft by 40 ft. Aisles are not provided for access to the machines, but for the stock. In the center of each 60 ft bay, there is an aisle with stock on either side, usually on roller conveyors which carry it toward machines and assembly stations along the longitudinal power conveyors adjacent to each line of columns.

The layout and handling studies embody three basic principles:

1. The location of the machines and their operators was determined by the weight and minimum movement of materials.

2. No piece is handled twice in the same form.

3. When material is moved, it is always set down at the next point of use.

In practice, what these principles mean is that incoming materials and components are moved from the trucks or freight cars directly to the machines which will first use them. There is no intermediate handling of materials from machine to stockroom or vice versa.

FOR THE COMPLETE REPORT—

Tentative plans have been made to publish the complete transactions, including the discussion, by the Wayne University Press. If you are interested in knowing the time and price write to Dr. Spencer A. Larsen, Director, Materials Management Center, Wayne University, Detroit, Michigan, or write "MH Economics" on the postcard elsewhere in this issue. The Editor will transmit your request to Dr. Larsen. This entails no obligation and is not an order. If and when the publication is available you will be advised of the time and price so that you may order.

Development of Costs and Production Units

By E. C. Stephenson

RETAILING is a very complex business. Our store operates 245 selling departments, 99 non-selling work centers, and about 45 semi-manufacturing operations. Our operating cost is $1.46 each time a sales check is written. The average purchase is $5.11. After taxes we earned less than 2 cents on each dollar of sales.

To give an idea of the material handling problems, in 1952 we received 495,000 shipments of merchandise and 45,000 were returned.

Merchandise represented in those shipments finally shook down into 33,000,000 packages. Of these, our own trucks delivered 9,200,000. At the present time we are building our third delivery substation.

We operate about 3,200,000 sq ft of floor space, over 1,000,000 ft of which is in warehouse and service buildings. A piece of merchandise is handled about six times.

EDITOR'S NOTE: After establishing the complexity of the department store materials handling problem, the balance of Mr. Stephenson's discussion dealt with accounting procedures to obtain costs of different jobs and a comparison between different stores. The uniform accounting manual used is a development of some 40 years by the National Retail Dry Goods Association, Harvard University, and the Associated Merchandising Corporation.

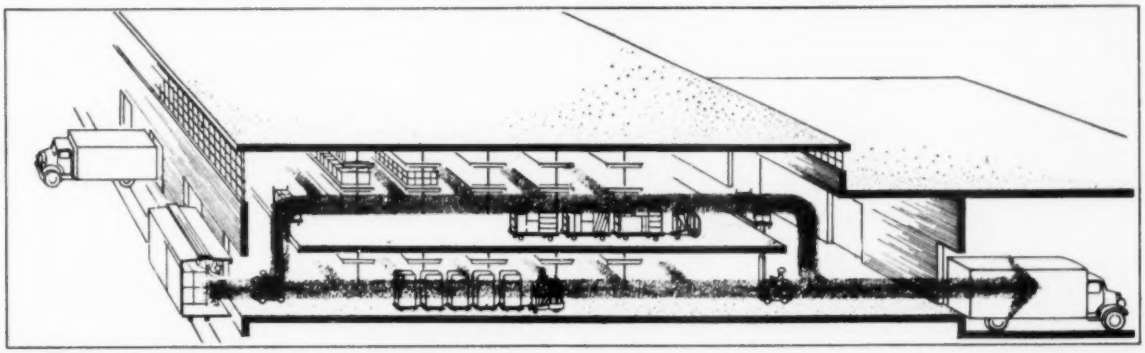


Fig. 2. This single story storage building with a full length mezzanine was designed to cut costs of retail distribution. The receiving areas run the full length on the left, the delivery area is at the right and the flow thru is direct

Fig. 1. The repellent is effective on magnesia pipe covering. A section treated with a 5 per cent solution will float on water for days, while an untreated section will sink in less than 15 minutes as shown in this laboratory demonstration

NEW WATER REPELLENT With Multiple Industrial Uses

MATERIALS ranging from paper and clay to concrete can be made water repellent by treating them with a solution of the sodium salts of certain silanols dissolved in water. This new material, known as XS-1, can be easily diluted with water and applied by brushing, spraying, dipping or mixing with paper or clay slurries.

Some of the projected uses for the material consist of rendering such materials as paper, wood, asbestos, brick and concrete water repellent. For example, paper plates and cups may be made water repellent, glass and ceramic insulator bodies may be enabled to resist additional vapor permeation. It has the added advantage of being mixable with slurries such as paper pulp or asbestos fiber dispersions.

XS-1 shows promise as a treatment to help soils retain a high wet strength, and as a soil stabilizer for engineering applications. It has great possibilities as a water repellent treatment for concrete and adobe structures.

The material is supplied at a solids concentration of 25 per cent, is easily diluted with water, and is effective in concentrations ranging from 0.5 to 5 per cent, depending on the material being treated and the effect desired. Dilute solutions are easily applied by spraying, brushing, immersing or mixing.

For maximum effectiveness, it is pointed out by the manufacturer, two coats should be applied, at least several hours apart. It will be observed that the second coat gives poorer wetting but a definite increase in water repellency is obtained.

For More Information

If you want additional data on the material either write the editor, 110 S. Dearborn St., Chicago 3, Ill., or use one of the postage-paid cards elsewhere in this issue. Just refer to "XS-1."

Fig. 2. Effectiveness of XS-1 as a soil stabilizer is demonstrated by immersing treated and untreated cylinders of packed damp clay in a half-inch of water. Two dips in 3 per cent solution is the equivalent of 0.1 per cent spray

Fig. 3. After one hour the untreated sample is more than 80 per cent disintegrated; the treated sample is still intact. Even after 17 hr immersion, only the bottom half inch of the treated cylinder begins to absorb moisture and lose strength

10 ....

VISUAL INSPECTION — Other Lighting Applications

By LEONARD V. JAMES, Fellow I.E.S., Illuminating Engineering Consultant

Fig. 1. Contour in polished surfaces, desirable or undesirable, is indicated by the reflection of straight lines or geometric patterns on surface of automobile

Fig. 2. Here is another application of principle in Fig. 1. Lines are painted on the diffuse transmitting panel

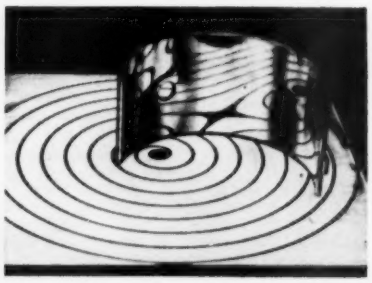


Fig. 3. Fluorescent or incandescent lamps must be spaced sufficiently close to avoid serious brightness variations

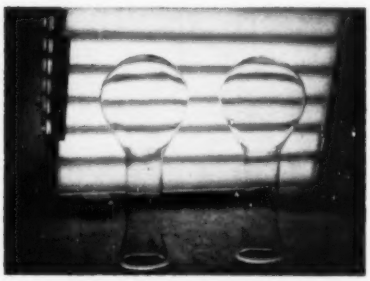


Fig. 4. Metal tapes held between two pieces of diffusing glass form pattern which reveals stresses in glass products

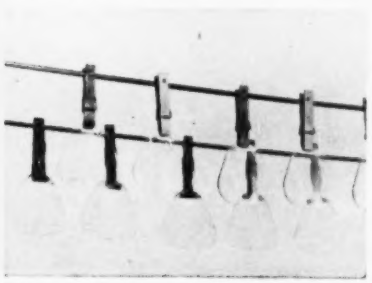


Fig. 5. Shadows cast on a screen by gas mask lenses, in a concentrated beam of light, plainly reveal defects

IN THE FIRST of these two articles (part 9) on sharpening vision for inspection, common procedures were described for increasing the brightness of the task and for accentuating its critical details of contrast and apparent size. By brightness is meant the amount of light energy reflected from the task toward the eyes, rather than glare. This article presents more unusual methods of accomplishing much the same results.

That irregular surfaces will reflect irregular images of straight lines or geometric designs is suggested by Fig. 1. Parallel lines of light are here distorted by an automobile body in a manner that eloquently indicates its curved contours.

Figures 2 and 3 illustrate possible practical plant applications of this principle, while Fig. 4 shows how an illuminated design may be refracted by an irregular transmitting surface.

A somewhat similar procedure to reveal defects in transparent surfaces is shown in Fig. 5. Here a group of gas mask lenses are suspended in a concentrating beam of light and the shadows examined. The pictures shown were published in an issue of Magazine of Light, through the courtesy of the Chemical Warfare Service, Army Service Forces. It should have many uses in industry.

Detecting Surface Flaws

Surface flaws in sheets of transparent material can be revealed by means of edge lighting. The surface reflects light admitted at the edge back into the glass or other material, with none of it escaping except at scratches or other irregularities. Figure 6 shows a sheet of glass lighted in the normal way and Fig. 7 the same glass lighted at its edge. Figure 8 shows a device which here introduces light into the edge of a sheet of plastic, which is now viewed against a dark background. A 15-watt fluorescent lamp, so placed that it is parallel to and near the edge of the plastic is used in this case.

This principle of the disclosure of surface irregularities by directing light along the surface on the inside, applies also to clear liquids. A concealed lamp immersed in a water

Fig. 6. Flaws in transparent glass or plastic sheets are not readily detected when inspected under ordinary light

Fig. 7. Edge-lighting the transparent sheet in Fig. 6, with ordinary lamps, makes surface defects clearly visible

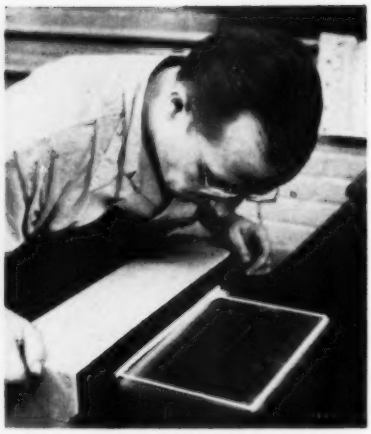


Fig. 8. Light from 15-watt lamp, in box and in line with edge of plastic sheet, clearly reveals surface imperfections

Fig. 9. Vinyl laminate for safety glass is placed above a polarizing screen resting on a sheet of diffusing glass and viewed through second polarizing screen

bath for testing tires, for instance, greatly facilitates locating the bubbles. The idea will suggest other applications.

Strains and stresses in mounted lenses, glass containers and transparent plastic working parts, or such models of opaque parts, can be observed by means of polarized light. Normal light rays oscillate in all directions. Polarized light oscillates in but one direction due to the influence of a polarizing screen.

In application in Fig. 9, vinyl laminate for safety glass is placed above a polarizing screen resting on a sheet of diffusing glass. The glass is lighted from below by means of 40-watt fluorescent lamps on 3-in. centers.

The inspector then examines the plastic through the second portable polarizing screen and observes the strains and stresses as color fringes or brightness differences in an otherwise dark background.

It is sometimes contended that nothing has color until it is lighted. A beautifully decorated room is completely black in the dark. When light is directed to or through its various surfaces, these surfaces have the faculty of selecting what radiated frequency or color is to be reflected or transmitted, making the objects discernible to the viewer.

Matching Colors

Inspection for color duplication or matching therefore requires that the light selected for inspection shall produce the same effect as will prevail later when the material is used. This means more than the color composition of the light for, as the level of lighting on a material is decreased, the saturations of its colors increase.

Figure 10 shows an inspection unit used to match paint colors. Because the final use of the product is not known, the customary procedure in

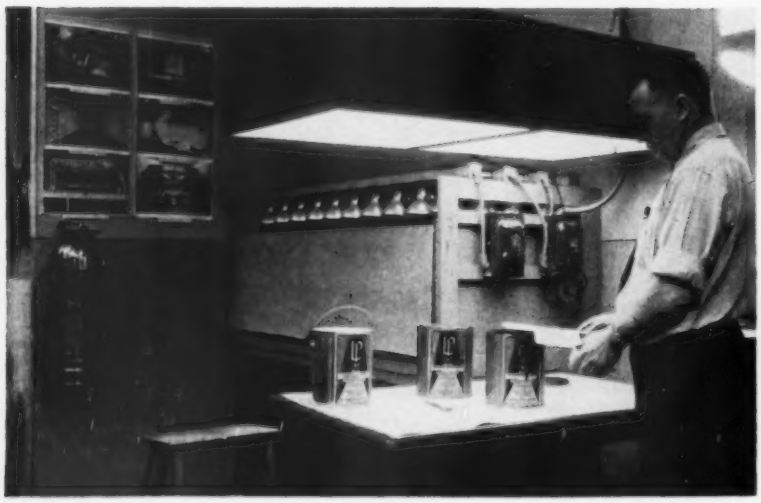


Fig. 10. This device is used to match paint samples. Samples are compared first under a ''warm'' light of 200 ft-c, then under a ''cool'' light of the same level. Lamps are above a frosted glass which prevents bright reflections in the wet paint

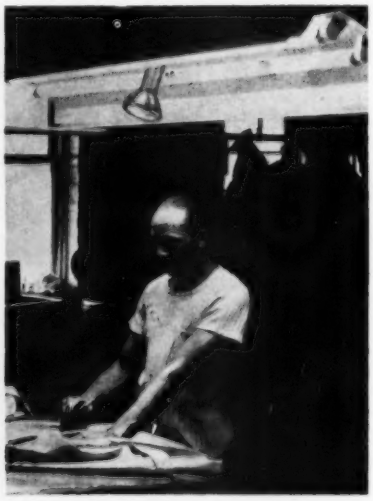


Fig. 11. Two extremes of color are used in this cleaning establishment—daylight fluorescent or incandescent

such cases is to match the colors under first a "warm" light and then under a very "cool" light. For the former, six 150-watt silvered-bowl lamps are employed. For the cool light, three 40-watt daylight fluorescent lamps, plus two 20-watt blue fluorescent lamps, are used. In each case the lighting level is about 200 ft-c. The lamps are above a frosted glass to avoid source reflections from the wet paint samples.

A very practical, if crude, application of this principle is shown in Fig. 11. The operator in the cleaning establishment watches for stains. The two near extremes of colored light for this purpose are provided by two 90-watt daylight fluorescent tubes in an RLM industrial reflector, plus one 150-watt PAR-38 incandescent flood lamp. Each arrangement will supply about 75 ft-c.

Inspecting Color-Plates

Color printing is accomplished by using, successively, various plates of but one color each. To inspect a proof, it is first necessary to inspect each of these color-plates and then the composite proof. Figure 12 shows a booth planned for this purpose. A light source complementary to the color proof being inspected, is first used to make the color on the proof appear dark and easily distinguishable from other colors or the background. The composite proof is then observed under a common standard such as the deluxe cool white fluorescent lamp.

Defects in materials can be indicated by applying a powder or liquid to the material being checked, with a view to indicating faults through establishing a highly visible contrast. Where the piece is of magnetic material and magnetized, a strong leakage field will be set up at the defect. Ferro-magnetic particles in the powder or wash will then accumulate at this point and indicate the fault. This will be the case even if the fault is slightly under the surface of the material.

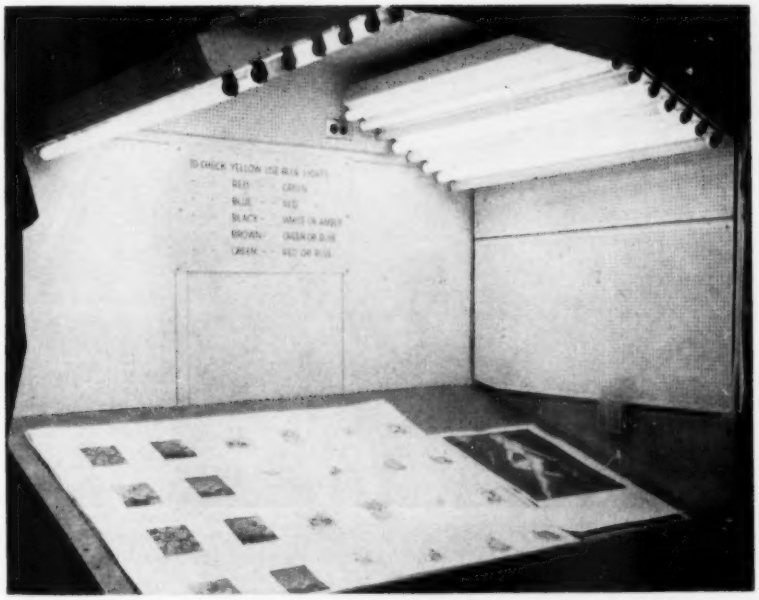


Fig. 12. In color printing, the plate for each color is first inspected under a complementary color of light. Blue lamps are used to check yellow proofs, green lamps for red proofs, red lamps for blue proofs, white lamps for black proofs, green or blue lamps for brown proofs, and red or blue for green proofs. After checking plates, complete print is observed under balanced light

The piece being studied may be magnetic or non-magnetic if it is washed with a penetrant containing fluorescent material. An accumulation of this will remain in surface cracks even after rinsing. The piece is then observed under "black light," radiation that is beyond the violet end of the visible spectrum but of such a frequency that it will make this material fluoresce. See Fig. 13. The accumulation of the fluorescent material will be greater the deeper or larger the defect.

A further procedure for non-conductors consists of applying a cloud of fine, electrostatically charged powder, blown onto the

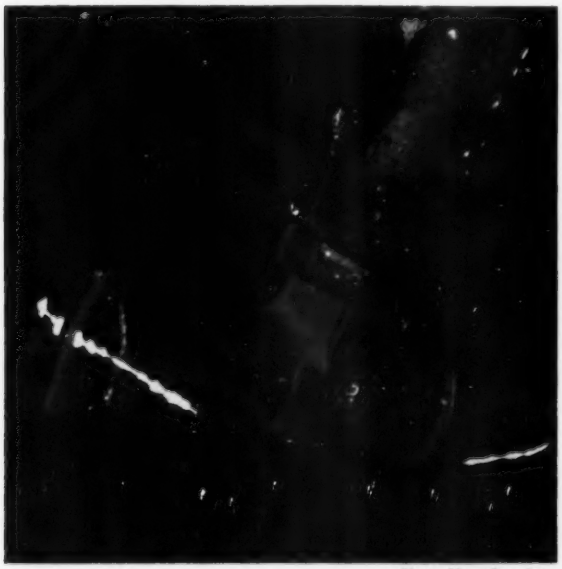


Photo: Magnaflux Corp.

Fig. 13. This forged aluminum pipe fitting was treated with a penetrant containing a fluorescent powder and then viewed under "black light," revealing these cracks. Accumulation of fluorescent material will be greater the deeper the defect

Photo: Magnaflux Corp.

Fig. 14. Electrostatically charged powder blown onto the surface of non-conducting materials adheres to and reveals imperfections by normal vision or by black light. Sample is porcelain enamel of which portion has been wiped clean

Photo: General Electric X-Ray

Fig. 15. Portable x-ray unit is being positioned for purpose of inspecting welds. The rays are emitted from the "snout," which increased the versatility of unit

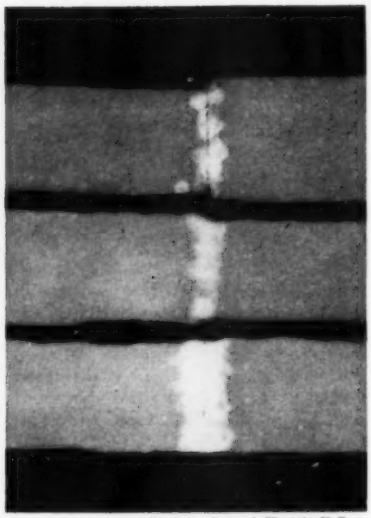


Photo: General Electric X-Ray

Fig. 16. Radiographs clearly show lack of penetration in the weld in upper rod

surface. This adheres at the defects. The powder is in a color that provides a sharply contrasting indication at the defect, as noted in Fig. 14. If desired, it may react to "black light." In certain cases, a conductor penetrant can first be used to increase leakage at the faults.

Checking Welds

High voltage x-rays also provide radiation by means of which faults can be indicated and the industrial use of such equipment is steadily increasing. A new portable x-ray unit has recently been made available which weighs less than 15 per cent as much as former 250,000 volt devices and may be operated from a power source in its nearby trailer.

In Fig. 15, an operator is seen adjusting this new unit for the checking of welds, which might be in steel up to 3½ in. in diameter. Figure 16 shows three such welds, the upper one of which is obviously poor.

A survey in two short articles of methods used to increase visibility for inspection can hardly present all such procedures. An effort has been made, however, to at least indicate some of the more common methods. It is hoped that sufficient detail has been given to enable the plant engineer to judge whether some of these methods of visual inspection have practical possibilities in his plant.

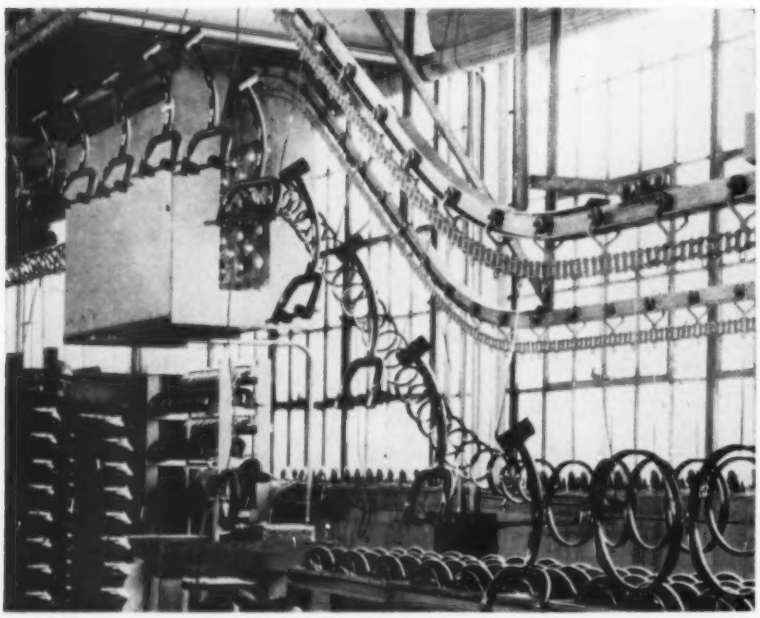


Fig. 17. Suspended oven at left contains 320 infra-red reflector lamps. Enamel on parts dries in about seven minutes, as product reaches temperature of 310 F

It has been shown how "black light," radiation beyond the violet end of the visible spectrum and therefore invisible and really not light at all, can be used in plant inspection work. Attention might well be directed, therefore, to a practical use of radiation beyond the red end of the spectrum—"infra-red."

The law of the conservation of energy indicates that all energy, including all radiated energy, ultimately becomes heat. But radiant energy has a unique value in that it does not become heat until it is absorbed.

This attribute makes it particularly useful for the rapid heating of enamels and paints, as well as of any opaque materials. The heat is provided by banks of "infra-red" lamps.

Main objective here being the production of heat with the desirable further characteristic of long life, the "lamps" are rated for voltages lower than would be the case were they to be used for light production.

Design of "infra-red ovens" for such lamps, see Fig. 17, is not complex but must be fitted to the process to which it is being applied. Lamp or oven manufacturers should be consulted, therefore, in each case, although literature is available which the plant engineer can use if he wishes to fabricate his own infra-red oven to process parts.

Keep Your Copy Intact

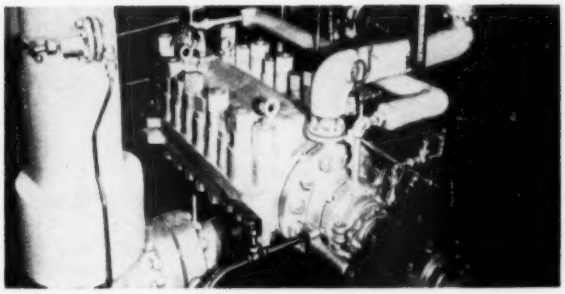
Readers wishing tear sheets of any article appearing in the issue for their personal file may obtain them by indicating the item desired on one of the post cards appearing in this issue.—Editors

Boiler Feed Pump Sets Longevity Record for Trouble-Free Operation

A boiler feed pump at the Windsor generating station in Power, West Virginia has completed its 100,000th hour of operation without being opened for inspection or repair.

The long-service machine is an Ingersoll-Rand pump, a horizontally split casing unit which delivers 1000 gpm of 380 F water at 1900 psi to the boilers. The pump's seven-stage rotating element is mounted on a heavy steel shaft and is over nine ft long.

Four other "sister" pumps at the station have records almost as good as the first. Unopened services of these pumps range from 50,000 to 80,000 hours.



Tank Trailer Formed of Glass-Reinforced Plastic Takes to Road

One of the largest one-piece molded structures ever made is a 3400 gallon reinforced plastic transport tank.

Built to carry formaldehyde and similar liquid chemicals, the tank is formed of American Cyanamid's Laminac polyester resin and fibrous glass reinforcement. Unmounted, it measures 21 ft, 9 in. long; 6 ft, 2 in. wide; and 4 ft, 4 in. high.

The tank weighs 3600 lb less than a similar steel tank, and its non-corrosive make-up precludes the necessity of special linings. It was manufactured over a wooden mold, with resin being sprayed on the mold, and then layers of glass mat added. A special catalyzed resin was then spread over each layer.

Clay Flue Liners Used for Acid Fume Venting System

Recently completed in Milwaukee, Wisconsin, a $2.5 million plant addition contains a unique clay flue lined ventilating system to carry away acid fumes.

At the Allen-Bradley Co., builders of motor control devices, the venting system is an integral part of the construction, being contained in the hollow concrete columns that comprise the supporting framework of the building. Each support column in the outside walls of the new addition contains three of the flues as its central core.

The liners were erected a story at a time, before any reinforcing rods were placed, or any concrete poured. This procedure was made possible and practical by the use of small metal channels, spotwelded base to base to form H-shaped aligning tabs. These tabs, when installed six at a joint, kept the sections of flue liners from slipping sidewise.

Mortar was used at the joints and was troweled smooth over the area surrounding the joint. Steel rod reinforcements were then placed, and wooden forms erected around the work. Concrete was poured to complete the support column.

Five thousand feet of 18-in. square clay flue liners were used in erecting 25 ventilating columns, each from the second story to the roof of the seventh story. Clay flue lining protects the containing columns from attack, and vents the fumes for harmless dispersal into the air. Some of the fumes carried in the plant ventilating system include those from quenching oils used in heat treating, exhaust gases from furnaces, silver brazing flux vapors, volatile metal oxides, dust and fumes from molding operations and degreaser vapors.

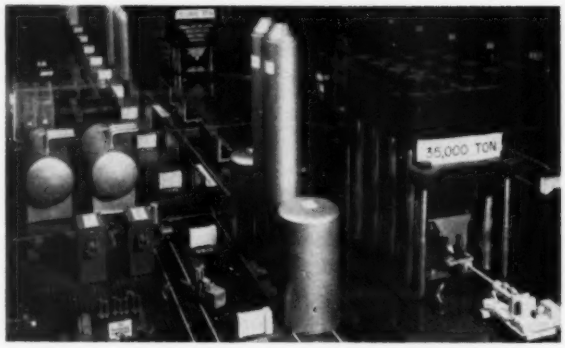
Scale Model Permits Checking and Changing Layout Before Building

Built on a scale of ¼ in. to 1 ft, a scale model of the new Air Force heavy press plant at Cleveland, Ohio, has allowed Aluminum Company of America to use the knowledge of the men at shop level, in planning the plant layout.

Ideas for the layout were first developed by construction and production engineers, and put on drawings and blueprints. From these, the 3-dimensional scale model was built.

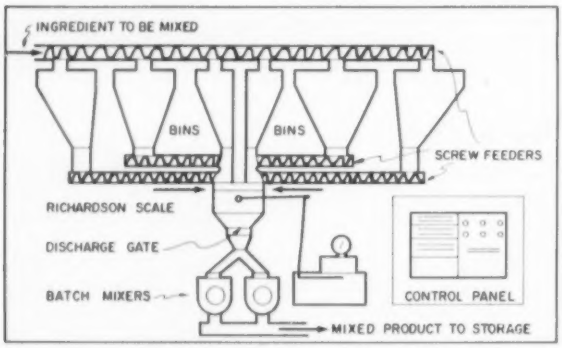
The use of the model provides a simple method for checking clearances horizontally and vertically, and works to great advantage by enabling shop supervisors, foremen and workmen to make constructive suggestions for improving the layout.

Spacing lines on the plastic floor are set at ¼-in. intervals, and heavy lines are laid out to represent subterranean structures such as sewers, water and air lines. At several locations the cross sections of the plant buildings themselves are built up, to further clarify the layout of the new plant.



Pushbutton Control Takes Over in Bulk Mixing Plant

Preparation of formula products in bulk quantities is the new method of operation in a feed mill in Elkhart, Indiana. The system used in the mill remotely selects, feeds, weighs and mixes up to eight ingredients, to turn a normally batch operation into a pushbutton feed mill.



Rather than using individual scales for weighing the different ingredients in the mix, one scale, manufactured by Richardson Scale Co., Clifton, N. J., will receive all ingredients and weigh them cumulatively.

During formulation, the operator works at a panel control board, selecting the type and weight of each ingredient going into the formulated mix. Pushing a single button then feeds the ingredients from their respective silos to a common hopper-scale for weighing. A scale dial indicates the total weight of product in the weigh hopper at any one time, and automatically shuts off the flow of material going into the hopper when the preset weight is reached. The cycle can be repeated for a predetermined number of batches without further manual attention from the operator.

Location of Equipment Moves Basement to Top of Building

Four large fans like the one shown are part of the new heating and ventilating system installed in what is probably the world's highest "basement." It sits atop the new engineering building of the Boeing Airplane Co., Seattle, Wash.

There are two big air supply fans which can turn out 234,000 cfm of filtered, washed, de-humidified and heated (or cooled) air.

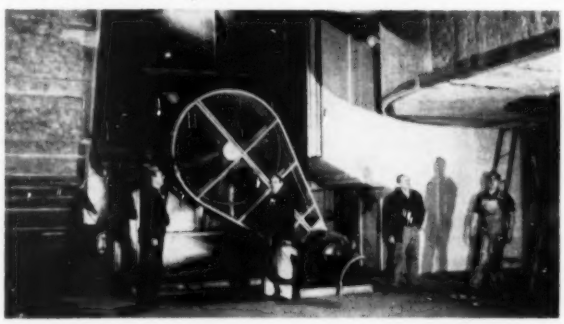
Air is carried to all parts of the 70-ft-high building by five large air ducts. The two exhaust fans located in the "basement" draw the air back upstairs.

Once the air is upstairs again it goes into a plenum chamber, a large insulated sheet-metal enclosure divided into a number of compartments containing heating-cooling coils, filters and water sprays.

The various compartments are connected by an intricate system of louvers and the system is automatic.

The cooling unit is capable of producing enough cold air to freeze 500 tons of ice an hour and on a hot summer day will maintain inside temperatures 10 degrees lower than on the outside. Approximately 120,000 sq ft of Fiberglas flexible duct insulation vinyl sprayed on one side, 20,000 sq ft of coated duct insulation and two carloads of pipe covering were installed in the system.

The insulation was manufactured by Owens-Corning Fiberglas Corporation.



Despite cleanliness and efficiency of a midwest firm's Plastic Division, shown above, there was "dirty work" afoot in the hydraulic systems of the injection molding machines. Division superintendent (left) and A. L. Seabaugh, of Standard Oil, came up with a solution.

Stops "dirty work" in hydraulic units

● A midwest company became increasingly aware that hydraulic oil performance in its fourteen injection molding machines was not all that it should be. Formation of oil deposits not only made frequent cleaning of filters necessary but posed a threat to efficient operation of the hydraulic units.

A Standard Oil lubrication specialist recommended STANOIL Industrial Oil, a top quality product of exceptionally high stability and containing necessary additives to prevent corrosion and oxidation troubles.

Throughout six years of continuous hard use, STANOIL has provided clean operation. It has not been necessary to replace any of the original fills of STANOIL, and only a small amount of make-up oil has been needed. Where filters previously had to be cleaned at least four times a year, they are now cleaned once each year. Hydraulic operation has been efficient and reliable.

STANOIL
TRADE MARK
Industrial Oil

You can rely on STANOIL to give you the same clean, dependable service not only in hydraulic units but in a wide variety of equipment. You can get the help of the Standard Oil lubrication specialist serving your section of the Midwest by phoning your local Standard Oil office. Or, write: Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Illinois.

What's YOUR problem?

A. L. Seabaugh, working out of Standard's Chicago office, is the lubrication specialist who helped this midwest firm gain both operating and maintenance benefits through use of STANOIL in hydraulic units.

Located throughout the Midwest is a corps of specially trained, experienced Standard Oil lubrication specialists, ready to give you prompt, on-the-spot help with lubrication in your plant. Their broad background of practical experience, plus their thorough training in Standard Oil Lubrication Engineering Schools, is yours for the asking. Simply phone your nearest Standard Oil Company office. The lubrication specialist will call without delay. He has a complete line of petroleum products to offer, including such outstanding lubricants as:

SUPERLA Greases — Available in a wide range of consistency grades and in both lime-soap and soda-soap types. SUPERLA Greases cover a wide range of operations. These efficient products are comparable in quality with the highest type of special greases.

STANOLITH Greases — Because these unique lithium soap products possess the heat resistant properties of soda-soap greases and the water resistant properties of lime-soap greases, they offer a solution to lubrication problems caused by the presence of both heat and water.

STANDARD OIL COMPANY

STANDARD (Indiana)

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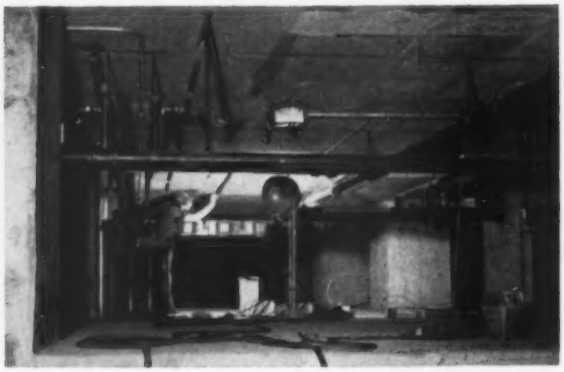
Service Areas Under Plant Floors Speed Servicing of Utilities



Located under the main manufacturing plant of the Parker Pen Co., Janesville, Wisconsin, a unique "access area" is expected to reap maintenance cost benefits.

The "area" is made up of 4-ft high tunnels, running under the floors, in which the utility lines are placed. These lines are suspended from the ceiling of the area, readily accessible for maintenance personnel. Reduction in time required to expose utility lines for maintenance or additions will be appreciable, in comparison with plants not similarly arranged.

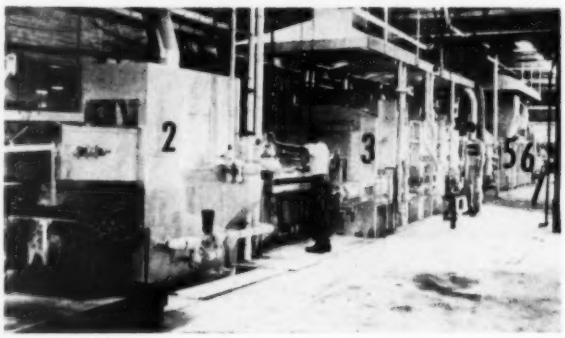
Sleeves through the area ceilings provide the necessary openings to feed utility take-off lines up to production machinery on the floor level above. These sleeves were poured only 2 in. thick, in the 9-in. floor slab, and while strong enough for the average traffic, they are easily penetrated for installation of additional lines.

Straight-Through Heat Treating Line Features Controlled Atmosphere

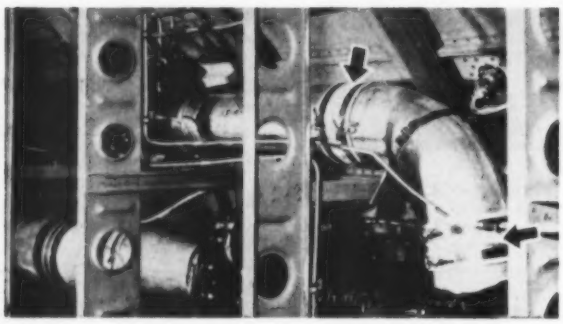
Built around a 30-ft long radiant tube hardening furnace and a special gas-cracking unit, an automatic production line, 110 ft long, is heat treating up to 50,000 screws an hour, at Standard Pressed Steel Co., Jenkintown, Pa. This line takes socket screws for a non-stop seven-operation, metallurgical processing tour.

All operations, as shown in the photograph, 1) weighing, 2) first wash, 3) hardening, 4) quench, 5) second wash, 6) tempering, and 7) rustproofing, are timed and connected by a series of powered belts and shaker conveyors. All handling is completely automatic.

Designed and installed by Surface Combustion Corp., the line uses its gas-cracking unit to produce an inert gas from propane, to feed into the hardening furnaces.



Silicone Rubber in Hot Duct Application in Airplane Manufacture



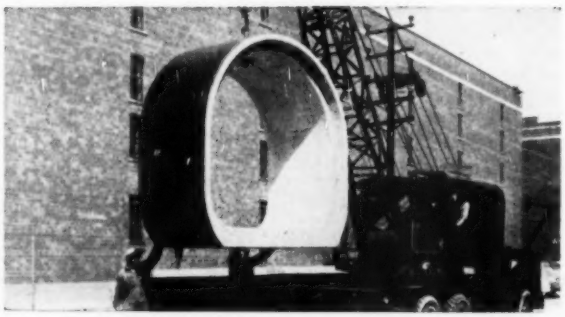
Heater ducts carrying air at a temperature higher than the melting point of solder are being coupled with a new flame retardant silicone rubber produced by General Electric.

In the model 30 Convair airliner, glass cloth connectors provide flexibility to more than 40 ft of aluminum exhaust duct. According to the manufacturers of the airliner, Consolidated Vultee Aircraft Corp., the ducts carry air at 450 F, and are designed for service as high as 600 F. The silicone rubber finish withstands this heat, and yet maintains good crease and abrasion resistance. It is also unaffected by hydraulic fluid—a vital consideration in the event of system leaks.

Precast Concrete Pipe Sections Fit Together to Form Underground Tunnel

In a new installation at the National Distillers Products Corp., Cincinnati, precast flat base concrete pipe has been used to construct an underground tunnel. To provide a pedestrian passageway and to house underground roller conveyor lines, the Universal Concrete Co. installed custom-built sections of 97 in. by 97 in. tongue-and-groove pipe between two plant buildings.

With the double-decked roller conveyor line running alongside one wall of the tunnel, sufficient room remains for personnel to walk between the buildings, while remaining underground. Self-closing fire doors at each end of the tunnel isolate the two buildings from one another in case of emergency.



"MIKE" NEEDS THE RIGHT LIGHT

COOLITE Glass Helps Boost Efficiency In Plant Performing Precision Defense Production

Precision-Plus is the watchword of the American Non-Gran Bronze Company, Berwyn, Pennsylvania, manufacturer of bronze bushings for Pratt & Whitney aircraft engines. This vital defense work requires extremely close tolerances—micrometer measurements in some instances down to 1/10,000 of an inch.

Coolite, Heat Absorbing, Glare Reducing Glass by Mississippi is used throughout the plant to glaze windows and skylights; since diffused, nonfatiguing daylight is a prerequisite for such precision work. Coolite glass filters out unwanted glare in natural daylight, floods all areas, including the inspection room with illumination conditioned for easier seeing. Coolite also absorbs solar heat rays, keeps plant interiors cooler, more comfortable, helps control rejects due to thermal expansion of metals.

"Coolite Glass A Sound Investment In Our Plant," says Engineering Manager

"The installation of Coolite Glass provides easier seeing and better working conditions in our plant," reports A. P. G. McGinnes, Jr., Engineering Manager, American Non-Gran Bronze Co. "It filters out annoying glare, makes working conditions more comfortable and helps to improve quantity and quality of production. Coolite has proved to be a sound investment."

SEE OUR CATALOG IN SWEET'S

Coolite has a refreshing, cool, blue-green color, modern in appearance. It reduces maintenance . . . no painted windows, makeshift shields or bothersome blinds. If you are planning new construction or modernizing existing facilities, specify Mississippi Glass to your architect or contractor. See how it can provide increased efficiency and economy for you. Get in touch with your nearby Mississippi Glass distributor today.

Send for free catalog, "Coolite, Heat Absorbing and Glare Reducing Glass."
Samples on request.

MISSISSIPPI *Glass* COMPANY

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NEW YORK • CHICAGO • FULLERTON, CALIF.

WORLD'S LARGEST MANUFACTURER OF ROLLED FIGURED AND WIRED GLASS

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1. They drink up water like an Airedale in August.

2. They're strong — even when soaking wet.

3. They're so soft that many people use them as face cloths.

4. They're clean and white — of course.

5. They're double-fold to dry double-quick.

EVER PLAY "GUESS THE WEIGHT"?

ScotTissue Towels have an exceptionally high fiber content. This "bulk," plus generous size and double fold, makes a case of 3,750 ScotTissue Towels weigh 46 lbs.* Some paper towels cost less for 3,750 but are 10 to 20 lbs. lighter*— hence less drying power. Write for more facts. Scott Paper Company, Dept. **PE-2**, Chester, Pa.

*Shipping weight

SCOTTISSUE **TOWELS**

Symbol of the right kind of washroom

"ScotTissue," Reg. U. S. Pat. Off.

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telling the story of 'dag' dispersions

Here is a Heat-Proof Dry-Film Lubricant

It's **'dag'** colloidal graphite. It comes dispersed in a variety of liquid carriers . . . water, oils, volatile hydrocarbons, resin-solvent combinations . . . which get it where it should go, and then put it to work.

Spray it on, paint it on, apply it by dipping. **'dag'** colloidal graphite produces a durable, *dry lubricating film* that won't gum up or break down at any of the temperatures you are likely to run into. It is unaffected by heat up to 750°F. . . . with a coefficient of friction so low that moving parts just keep on moving.

'dag' colloidal graphite works where conventional lubricants have failed . . . on oven conveyors, in bearings of kiln-car wheels, on conveying equipment for hot strip steel, and in places where degreasers destroy most lubricants . . . almost everywhere that high heat and friction must be licked to keep things going.

Let **'dag'** colloidal graphite dispersions cure these headaches for you. Details are available in Bulletins No. 424-22K and No. 435-22K.

Dispersions of molybdenum disulfide are available in various carriers. We are also equipped to do custom dispersing of solids in a wide variety of vehicles.

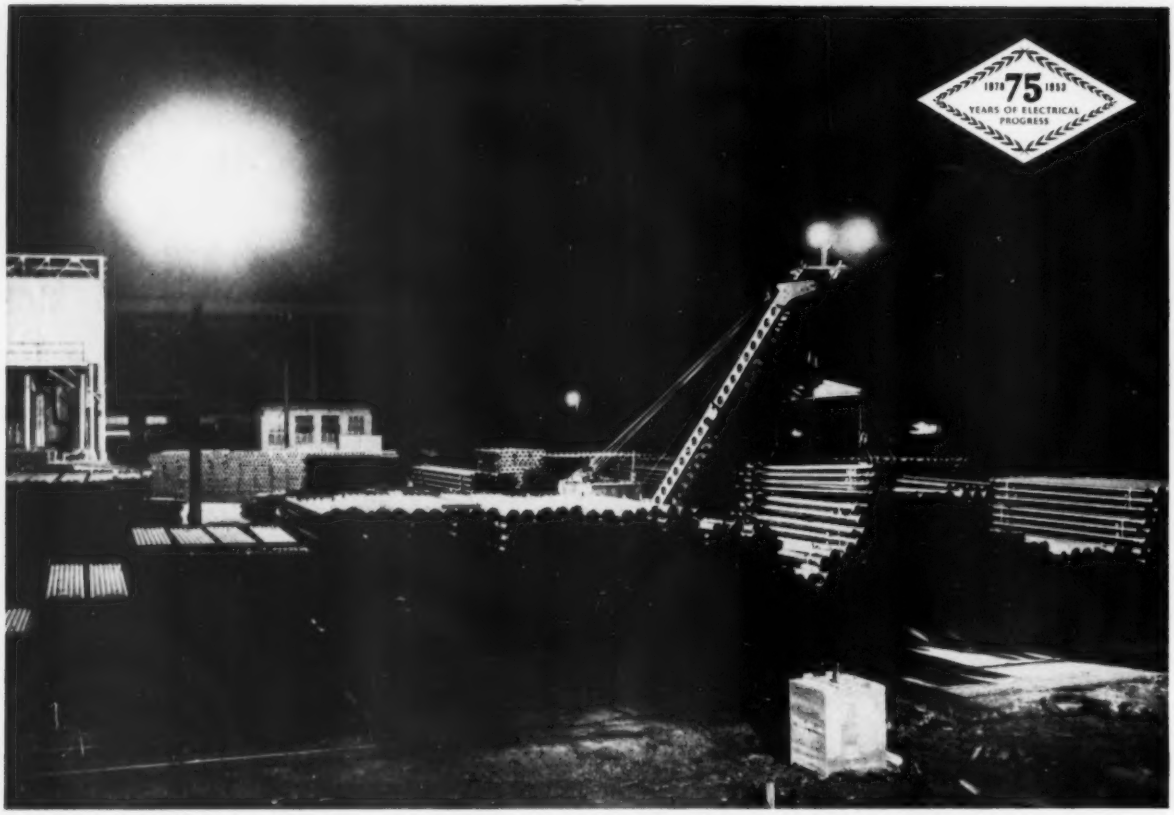
dag DISPERSIONS

Acheson Colloids Company, Port Huron, Mich.

. . . also ACHESON COLLOIDS LIMITED, LONDON, ENGLAND

Units of Acheson Industries, Inc.

try resin-bonded dry graphite films for permanent lubrication



USED 10 HOURS A DAY, G-E L-69 FLOODLIGHTS DOUBLE USEFULNESS OF OUTDOOR STORAGE AREA.

G-E Floodlighting in company's storage yard makes possible two-shift materials handling

A LIGHT FOR EVERY NEED is available from G.E.'s full line: **A** High efficiency, lightweight, easy-to-install area floodlight for crossarm mounting, available in any of three beam spreads; **B** Heavy-duty, wide variety of mountings, and beam spreads; **C** Inexpensive, open floodlight for closer-range illumination.

"In our plant, two-shift operation would have been impossible without outdoor materials handling at night. We installed G-E L-69 floodlights in our outdoor storage area, and used them 8 to 10 hours a day to keep our materials moving in and out of our factory," says A. J. Fruchtl, plant manager at U. S. Pipe & Foundry Company's North Birmingham Works.

You can double the usefulness of your outdoor areas with G-E Floodlighting. And good floodlighting means good working conditions, fewer accidents, less pilferage. You'll find that an investment in adequate G-E outdoor lighting will pay for itself over and over again.

Whatever your outdoor lighting needs, G.E. has a complete range of industrial lighting equipment to exactly suit your requirements. Call your local G.E. Sales Office or authorized distributor for advice on good lighting at your plant. Or write for "Outdoor Lighting for Industrial Plants." Just ask for GEA-3640. Address Section 451-186. General Electric Company, Schenectady 5, N. Y.

You can put your confidence in—

GENERAL ELECTRIC

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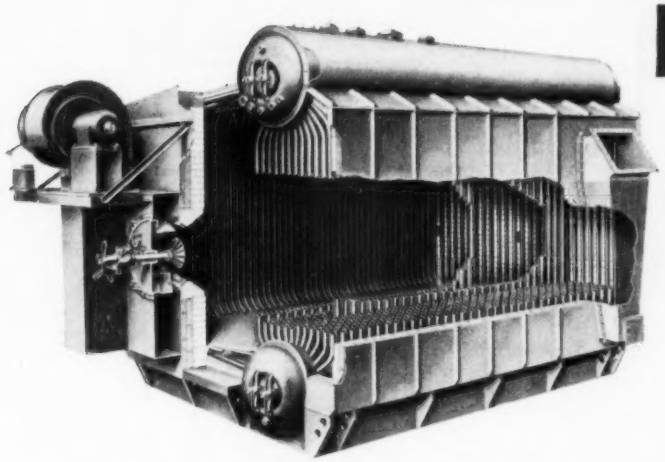
FOR STEAM CAPACITY up to 60,000 POUNDS

Choose your boiler from these two

If you burn oil or gas, investigate the VP Package Boiler for capacities up to 30,000 pounds per hr . . . the VU-10 up to 60,000 pounds.

For stoker firing, the VU-10 is available from 10,000 to 60,000 pounds of steam per hour.

Whatever your fuel . . . whatever your steam capacity requirements up to 60,000 pounds per hour — you'll find that one of the Combustion Engineering Boilers described below will be just right for you.



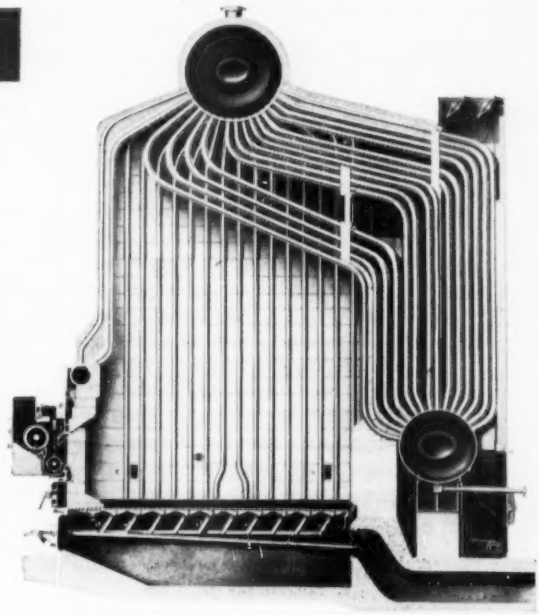
The VP Boiler — the Package Boiler with EXTRA Features

THE VP BOILER

The C-E Package Boiler, type VP . . . completely shop-assembled . . . for oil or gas firing. It is available in capacities from 4,000 to 30,000 lb steam per hr; for pressures to 250 psi. The VP Boiler has more water-cooled area per cubic foot of furnace volume than any other boiler of its size and type. The large (30-in. diameter) lower drum permits a simple, symmetrical tube arrangement . . . greater water storage capacity . . . easy access for washing down or inspection. The centrifugal fan is efficient, yet its noise level is less than half that of typical high-speed blowers used on most package boilers. Baffle arrangement is simple, resulting in low draft loss . . . simple soot blowing . . . elimination of dead pockets . . . high heat absorption.

THE VU-10 BOILER

The VU-10 Boiler is designed for industrial load conditions, particularly for plants with small operating and maintenance forces. Capacities range from 10,000 to 60,000 lb steam per hr . . . pressures to 475 psi . . . heat recovery equipment is available if desired. Fuel can be either coal (C-E Spreader, Traveling Grate or Underfeed Stoker) oil or gas. This boiler is a completely standarized design adaptable to many conditions. It responds readily to variations in load; it is simple to operate and maintain. All parts are easily accessible for inspection. Like the VP, the VU-10 Boiler is a complete unit — boiler, furnace setting, fuel-burning equipment, controls, forced draft — bringing you the benefit of one contract . . . one guarantee . . . one responsibility.



The VU-10 Boiler, as arranged for C-E Spreader Stoker firing

COMBUSTION ENGINEERING, Inc.

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ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT

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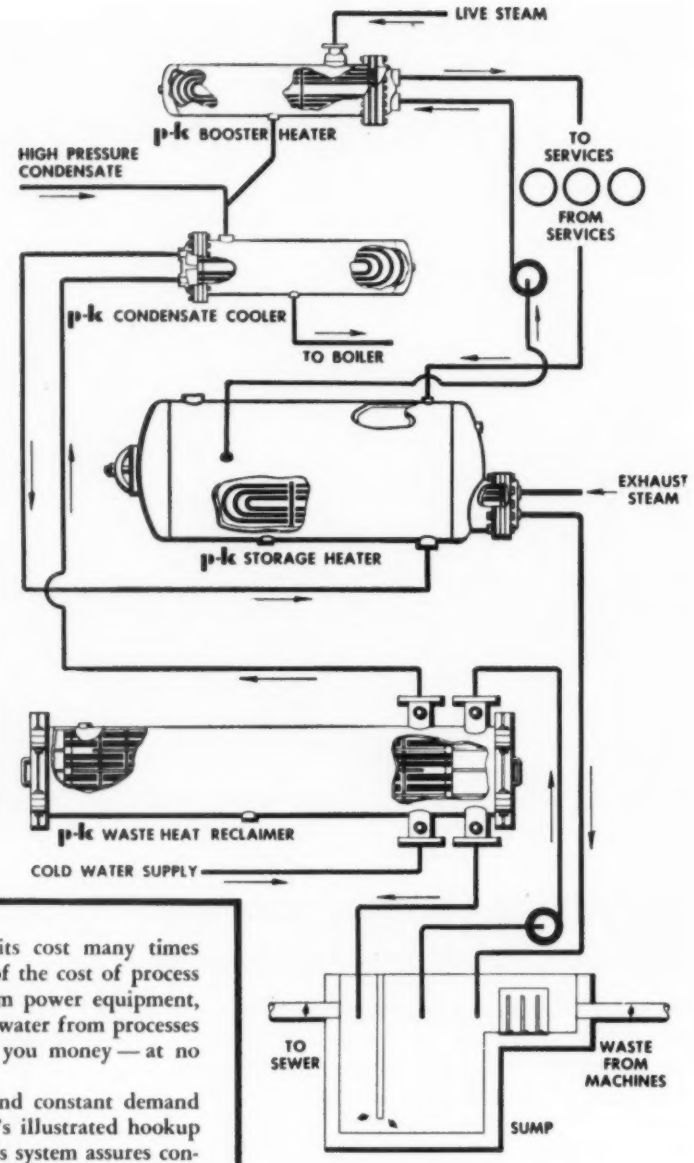
how to exchange heat and save half your fuel dollar



p-k hot water supply system — one of numerous variations — for maximum heat recovery in processes using large quantities of hot water.
Whether your operation is in the textile, chemical, laundry, pulp and paper fields, or any field where hot water is required, **p-k** can recommend the proper recovery system for optimum heat balance.

p-k equipment can earn its cost many times over, save 50% and more of the cost of process heating. Exhaust steam from power equipment, or condensate or waste hot water from processes — can go to work saving you money — at no added operating cost.

When there is a large and constant demand for hot process water, **p-k**'s illustrated hookup No. 1 is recommended. This system assures control of temperatures, pressures and velocities at all plant stations. Substantial increases in production can be made without additional equipment.

p-k reclaimers, storage heaters, condensate coolers, booster heaters, etc. are available in many standard sizes and types to meet most industrial or commercial requirements.

Learn more about the sure savings available to you — write now for complete information. Ask for Cat. No. 310. Further information and engineering assistance will be gladly provided without obligation.

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Gives white hot steel the "kid glove" treatment

GIGANTIC MACHINES with thousands of moving parts are used to shape white hot ingots into plates and sheets. All of these hard-working machine parts are subject to intense heat . . . normal in steel manufacturing. Because of the intense heat, lubrication is a serious problem.

U. S. Steel has tried various types of greases in order to eliminate the problem of oil burn-out. Now they're using a product of Shell Research, Shell Alvania Grease. Result: better lubricating action *at once*. Months after the original installations, rollers were removed and an excellent film of grease was still present.

At the other extreme, zero weather caused grease in an automatic lubricating system to congeal and become unpumpable. Shell Alvania was tried and clogging promptly stopped. This multi-purpose grease is now used extensively in low-temperature operations at U. S. Steel's Ohio Plant.

SHELL ALVANIA GREASE

- **resists oxidation**
- **will not squeeze out**
- **extends periods between overhauls**
- **provides exceptional lubrication in high or low operating temperatures.**

Shell Alvania Grease can cut down costly maintenance and save time and money in *your* plant. Write for technical information.

SHELL OIL COMPANY

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SAN FRANCISCO 6, CALIFORNIA

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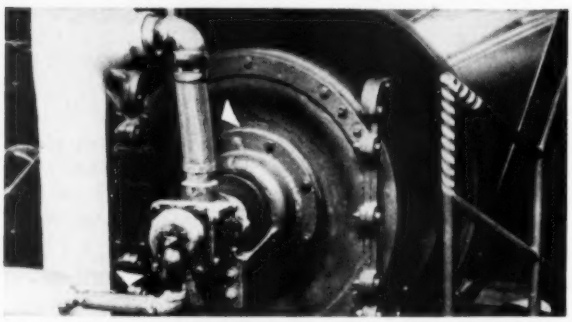
News about flexible metal hose and tubing

Here are 3 ways they have been used to simplify design, production and maintenance problems

CONVEY GRAIN — Here, American Flexible Metal Hose is used as the conveying line in transfer trucks handling off-the-track bulk shipments in any kind of weather. Holly Pneumatic Systems, Inc. of New York, the manufacturers, use American Type UI tubing in lengths of 20 to 30 feet, in ID's of 6 to 7 inches. This hose stands up under flexings, positions easily and requires little maintenance. If you need a connector that must move, bend or convey liquids, semisolids or gases, American can supply you with a flexible metal hose or tubing of the right alloy.

Holly Pneumatic conveying systems are individually designed for handling a long list of loose bulk materials—cement, cocoa, iron chips, soda ash, and many others.

CARRY STEAM — No more swing joints here! The Chicago, Rock Island & Pacific R. R. Co. uses American Seamless Flexible Metal Tubing to connect railroad terminal steam heating lines. Easy to connect and disconnect, this flexible tubing won't swell or collapse under pressure changes. Use it wherever a leakproof steam connector that must take rough treatment is needed.



CONNECT MISALIGNED PORTS — Where slightly misaligned ports must be connected, American Flexible Bronze Tubing provides the answer . . . as on this Beloit Iron Works paper mill dryer. Here it also dampens vibration and noise and conveys steam. Use American Flexible Metal Hose to connect hard-to-get-at ports. It cuts assembly time and costs, simplifies design.

53214

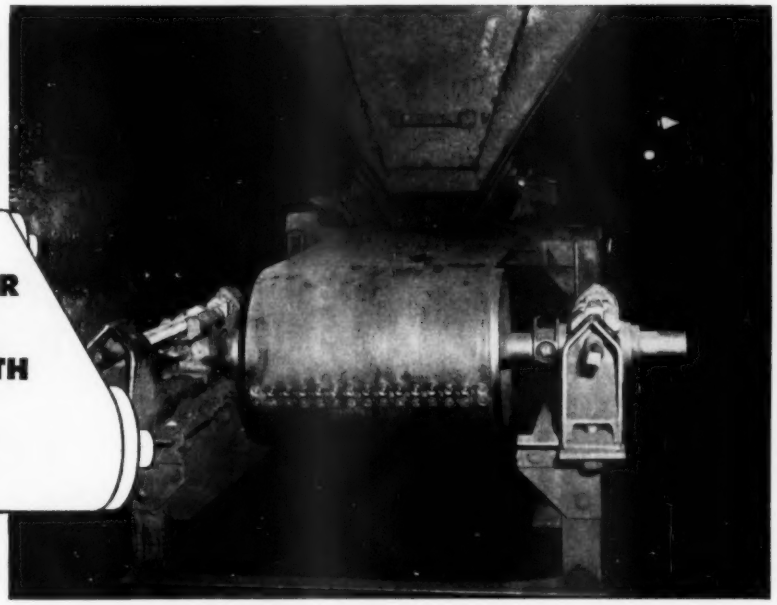
WRITE FOR CATALOG CC-400: *shows how the tubing is designed, used and installed—gives specifications on tubing and fittings. The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn. In Canada: The Canadian Fairbanks-Morse Co., Ltd.*

ANACONDA

wherever connectors must move . . . *American* flexible metal hose and tubing

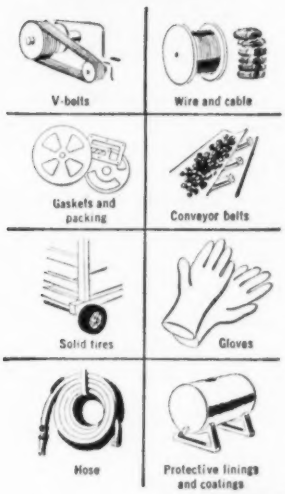
For more facts circle 567 on Reply Card

BETTER RUBBER PRODUCTS ARE MADE WITH DU PONT NEOPRENE



Neoprene conveyor belt outlasts other belts 4 to 1 carrying hot sand in foundry

SPECIFY NEOPRENE IN THESE PRODUCTS:



A large steel castings company was plagued by frequent breakdowns of the conveyor belt on its shake-out machine. Jagged metal fragments and hot sand at temperatures of 200° to 500°F. were cutting service life of asbestos conveyor belts to 90 days. A production bottleneck threatened . . . until a belt with a heat-resistant neoprene cover was installed.

The neoprene belt lasted four times longer than the asbestos belts—*one full year of trouble-free operation!* On this application, the severe abrasion conditions rapidly wore away asbestos belts; ordinary rubber belts soon failed from the intense heat. These are rugged service conditions for *any* conveyor belt . . . and offer striking proof of neoprene's toughness and its resistance to heat and abrasion.

This same dependability can be found in thousands of neoprene products currently lowering production costs throughout industry. While Du Pont makes no finished goods of neoprene, your manufacturer or distributor will be glad to tell you about neoprene products he supplies.

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

NEOPRENE

The Rubber Made by Du Pont Since 1932

MAIL THIS COUPON TODAY

FREE! THE NEOPRENE NOTEBOOK—Every issue describes new products, unusual applications of neoprene . . . shows how neoprene cuts maintenance costs. Clip and mail this coupon to get on the mailing list. E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division PL-10 Wilmington 98, Delaware.

Name_____ Position_____

Firm_____

Address_____

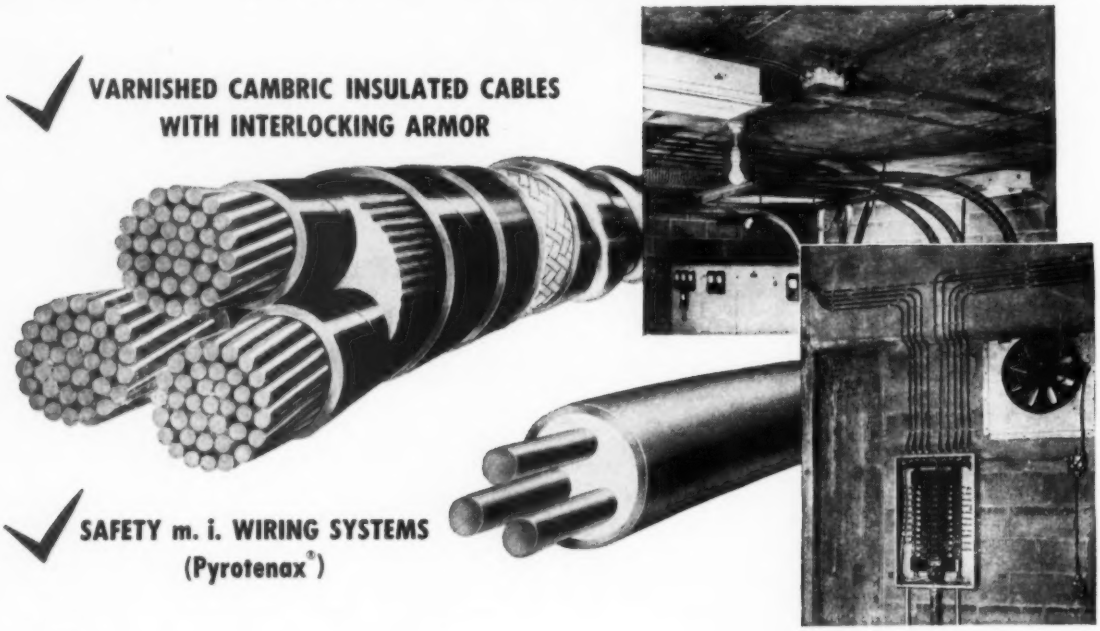
City_____ State_____

For more facts circle 568 on Reply Card

☑ CHECK General Cable "POWER TWINS"

Modern, All-purpose Plant and Equipment Wiring

✓ **VARNISHED CAMBRIC INSULATED CABLES WITH INTERLOCKING ARMOR**



✓ **SAFETY m. i. WIRING SYSTEMS (Pyrotenax®)**

On any new plant construction job, the General Cable "Power Twins" provide today's modern, flexible wiring team for all power, lighting, control and machine tool applications. Can easily be shaped on the job. Especially economical and adaptable in close areas under and around beams and pillars.

- **VARNISHED CAMBRIC with Steel, Bronze or Aluminum Interlocked Armor**
  Designed for both high and low voltage power feeders.
- **SAFETY m.i. WIRING SYSTEMS (Pyrotenax®) Type m.i. 1953 Code Approved**
  A General Cable exclusive, offering a dramatic new advance in electrical wiring for all applications up to 600v. where heat, vapors, moisture, aging are of particular concern. Ideal for low voltage, lighting, power, control, machine tool and equipment uses. Lower installation costs, rigid yet flexible, and immune to age deterioration due to its "all mineral construction."

Your nearest General Cable representative can show you the many advantages of wiring with the "Power Twins." A call will bring him quickly, or write Headquarters.

Other General Cable Wires and Cables for Plant Construction include:

Asbestos Varnished Cambric and all Asbestos Power and Control Cables

Super Service Portable Cords and Cables for power, lighting, control and machine tool leads to bussways, small tools in plants, etc.

Super Service and low-cost Welding Cables

SUPERSHEATH "TRIPLETS"

- Type USE—Thermax W insulation with Neoprene Jacket for direct earth burial service entrance.
- Type RHWN—Thermax W insulation with Neoprene Jacket for aerial, duct, conduit and direct earth burial applications.
- Type GN—Gencorone (Corona resistant) Insulation with Neoprene Jacket for medium and high voltage applications—all types.

Rubber and Plastic power and control cables, Rubber or Gencorone (Corona resistant) or Plastic insulated with braided, leaded and armored finish. **. . . and other types.**

GENERAL CABLE
CORPORATION

Executive Offices: 420 Lexington Avenue, New York 17, N.Y. • Sales Offices in Principal Cities of the United States

For more facts circle 569 on Reply Card

Here Are Facts You Should Know About Electric Motor Bearings

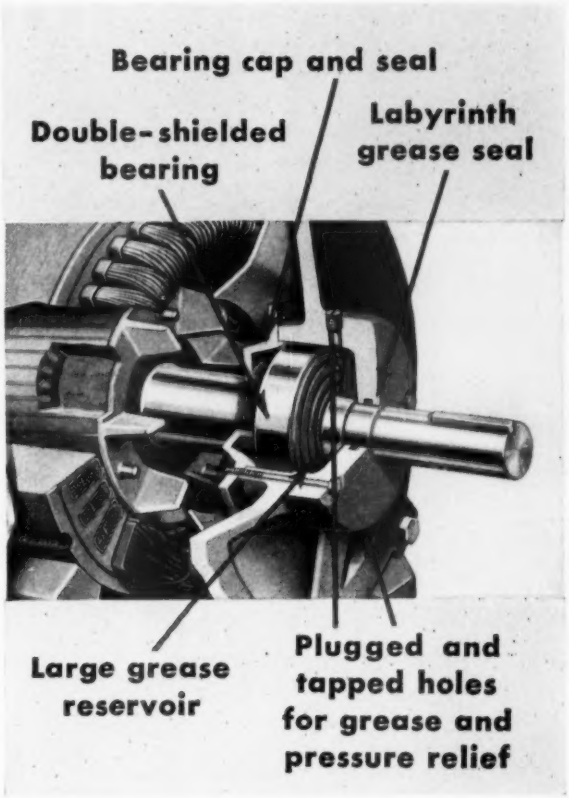
AN ideal motor bearing would operate for indefinitely long periods under all types of conditions without requiring any attention whatever. However, in the opinion of our engineers, such a bearing and its attendant lubricant are not yet available on the commercial market. Consequently, bearings for many types of operations, particularly where overloading, extreme temperature ranges and chemical and dirt laden atmospheres are involved, require special lubricants or regular lubrication schedules.

Of course, bearings suitable for many kinds of operation under normal conditions can be built to require no attention for very long periods — usually several years. Allis-Chalmers can supply sealed bearings in all frame sizes through 505 on short delivery and without extra cost for applications of this type.

Which is the Best Design for *Your* Application?

We believe that the design used in standard Allis-Chalmers drip-proof, tefc and explosion-proof motors represents the best design for most industrial users.

The Allis-Chalmers standard design consists of a pre-lubricated, double-shielded bearing mounted in the end housing with a generous grease reservoir. Plugged and tapped holes are provided for grease and for pressure relief. Under normal operating conditions, this design will operate as long without attention as any other type of bearing in use today. But where difficult operating conditions make re-lubrication desirable, it can be done as part of the normal lubricating routine without dismantling the motor.


Bearing cap and seal
Double-shielded bearing
Labyrinth grease seal
Large grease reservoir
Plugged and tapped holes for grease and pressure relief

The large grease reservoir and shielded bearing design assure that grease lost from the bearing due to high operating temperatures or other causes will be replaced automatically.

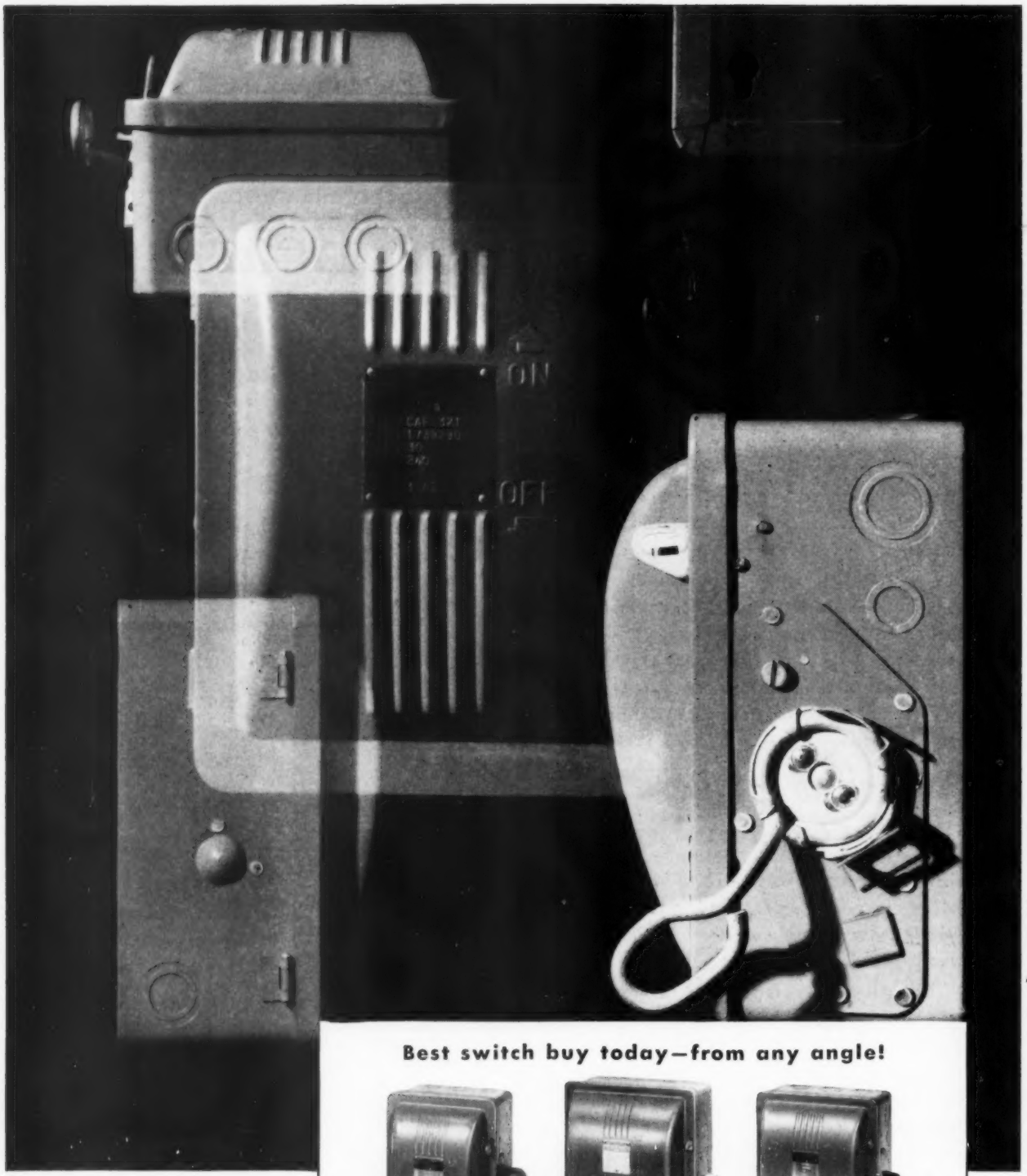
For further information on bearing design and other features of Allis-Chalmers motors, call your nearby Allis-Chalmers District Office or Authorized Distributor.

A 4147

ALLIS-CHALMERS

Milwaukee 1, Wisconsin

For more facts circle 570 on Reply Card



Best switch buy today—from any angle!

Heavy Duty
Industrial Applications

Industrial and Commercial
Applications—Type CA

Light Duty,
General Purpose

New *Life-Line* CA Switch gives greatest value today!

Meets NEMA Type A specifications at Type C prices

Now, in ONE great new switch, you can get the toughness, safety and lifetime performance of Westinghouse Type A quality switches in the price range of conventional Type C switches. The new CA licks the problem of matching economical first cost to service versatility in a broad range of commercial and industrial applications.

The CA is designed with a quick-make, quick-break, spring-operated mechanism. New interlock prevents opening of cover while switch is in "on" position. Horsepower rated, these switches can be used on inductive circuits.

Your biggest plus in the new CA is the protection, long service and basic economy of all Westinghouse switches—in the exclusives that conventional Type A switches cannot touch. Exclusive diamond-pointed breakjaw keeps arcing outside contact area, eliminates burning and beading, prolongs contact life. Exclusive one-piece copper construction of contact jaws, hinge jaws and terminals reduces heat power losses. Nowhere else can you get these and many other switch lifesaver benefits. Stack dollars against safety switch performance anywhere and, mechanically and electrically, you'll find Westinghouse switches the greatest value in a decade.

For extra tough applications demanding sheer strength and stamina, get the Westinghouse heavy duty Type A Switch.

See your Westinghouse Distributor. Have him demonstrate his full line of Westinghouse A, CA and D switches for NEMA Type 1 applications. Delivery—immediate. Write for new Booklet B-4723, Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. J-30164

YOU CAN BE **SURE**...IF IT'S

Westinghouse

For more facts circle 571 on Reply Card

NEW PRODUCTS & PROCESSES

summarized for your convenience

Edited by M. E. Heniken

1—IMPACT WRENCHES come in three popular sizes

These three pneumatic impact wrenches are said to offer capacity, power and size to meet individual needs for all tightening or removing of bolts and nuts, for removing of broken cap screws and studs. They do tapping, reaming, driving and removing of lag screws and spike screws. The Model PW-5014S, the "Squatty," takes ⅞ in. bolt or nut; its spindle has ¾ in. square drive, and its speed is 1600 rpm free at 90 psi. The Model PW-4012P takes ¾ in. bolt or nut; its spindle has a ¾ in. square drive, and its speed is 1300 rpm free at 90 psi. The Model PW-308P has a capacity of ½ in. bolt or nut, a spindle with ½ in. square drive, and a free speed of 1400 rpm at 90 psi. All three wrenches have automatic oiler and pin lock. Mall Tool Co.

2—PAPER WIPERS are clean, strong, easily disposable

Each of these paper wipers consists of two "Perf-Embossed" sheets which, by a special process, are welded together for durability, good cleaning action, and maximum dirt retention. They are chemically treated for wet strength.

Besides offering a solution to the problems of high unit and handling costs, erratic performance, and pilferage, common to many industrial wiping methods, these disposable wipers have important safety and sanitary advantages. When a man takes a fresh

one out of the box he's not risking cut hands from steel shavings left from a previous wiping job. And, manufacturer points out, there's less possibility of dermatitis spreading through a plant when there are plenty of clean wipers.

There are 125 wipers in the compact box, which is so designed that as one wiper is removed, another is pulled into position for easy removal. Literature is available. Scott Paper Co.

3—UNIT HEATERS, vertical delivery, in 26 models

An improved line of vertical delivery unit heaters for steam and hot water features lighter weight which, according to manufacturer, has been achieved without sacrificing structural strength or durability. The largest model—of 600,500 Btu per hour capacity—weighs only 284 lb. Advantages announced for the lighter weight are ease of handling during installation and the elimination of structural ceiling supports required for mounting heavier heaters.

Performance has been improved by increased heat transfer capacity as related to motor horsepower company says, and by stepped-up air volume and

velocity. Outlet air temperatures have been retained in the 110-120 F range for comfort and fuel economy. The new heaters have circular casings and coils.

Of the 26 models available, 13 are for normal steam pressures and 13 with lower outlet temperatures are for high pressure steam. A choice of five types of air deflectors (optional at extra cost) is offered. Bulletin 153 describes these vertical delivery units and other heaters. Modine Mfg. Co.

4—WATER REPELLENT for protecting masonry surfaces

Arroc is described as a clear silicone resin material that soaks into masonry and does its work without affecting the outward surface appearance. A "breathing" material, it allows water vapor to escape, it is explained, but admits no seepage or moisture penetration. Tests are reported to show that, because of the high percentage of silicon in the formula, exposed Arroc-treated common brick absorbs moisture totalling less than 2 per cent by volume, as compared to a total pick-up by untreated brick of 31 per cent.

According to manufacturer, Arroc prevents moisture-absorption at the surface and below it, by coating the granules of aggregate with an impervious silicone resin film which lets moisture from within evaporate normally while it blocks the entrance of moisture from without. Arroc is flowed on liberally by brush or very low pressure spray. It is said to become water repellent in 24 hours, and to attain a high degree of water repellency in 12 days which will last for years. Because of its "breathing" properties Arroc is not suitable for use on tile, glazed brick or other surfaces where it cannot be absorbed, or where hydrostatic pressure is present. A catalog sheet gives data on Arroc. The Arco Co.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards on pages 35-36 and 185-186.

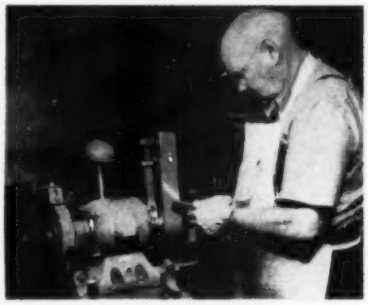
5—ADHESIVE binds Teflon to Teflon, other materials

Flexrock 80 is a newly developed adhesive for binding Teflon to Teflon, or to metal or to a variety of other materials. Tests on this pressure sensitive adhesive are reported to show a peel strength of 1000 g per inch or a direct pull of 12 to 15 psi for Teflon to Teflon and Teflon to stainless steel. It is also stated that this adhesive has good acid and alkali resistance, and excellent electrical properties.

It can be applied by brushing, dipping or spraying. For small applications, brushing is said to be adequate. After applying Flexrock 80 to the Teflon, the adhesive should be dried before pressing the parts together. Air drying is satisfactory, manufacturer says, but it takes several hours. Drying time can be reduced by heating for 15 to 30 min at about 210 F; and heating for 5 min at 300 F will result in greater adhesive strength, it is pointed out. The material is now available in small quantities for test at $3.50 per pound. Packing Div., Flexrock Co.

6—BELT ATTACHMENT for grinding, polishing jobs

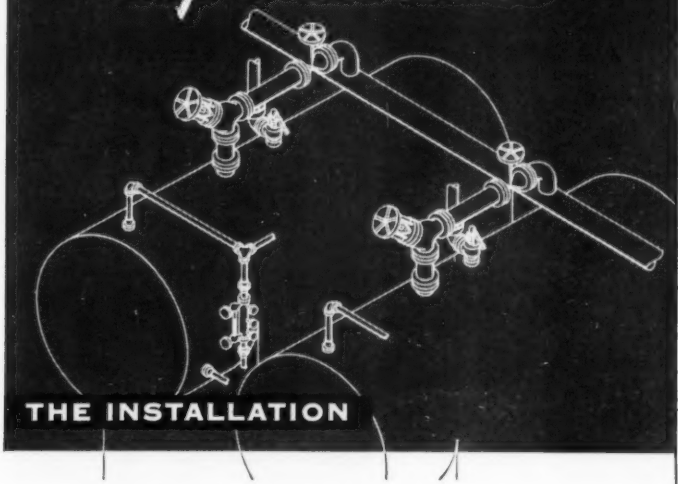
Announced as one of the most universal of attachments, the Adapt-A-Belt is intended for use as a portable grinder attached to an air outlet, or to clamp on lathes, milling machines, drill presses or pedestal grinders to do work quickly on jobs that don't warrant setting up



a machine. Advantages claimed for the belt include the use of dynamically balanced rubber covered contact wheels.

The Adapt-A-Belt is of steel construction. Grinding can be done with either end or slack belt. Two models

30 Years of Safety and Efficiency with these High Quality Stop-Check Valves



THE INSTALLATION

At the Eureka Redwood Lumber Company, Eureka, Calif., featuring eight 5-in. Crane stop-check valves on boiler lines to main steam header.

VALVE SERVICE RATINGS

SUITABILITY:	On the job for 30 years
FEATURES:	Only one moving part
MAINTENANCE COST:	One seat regrinding only
SERVICE LIFE:	Installed 1923 – still O.K.
OPERATING RESULTS:	Efficient performance — safe operation
AVAILABILITY:	Crane Catalog item – No. 30E

THE CASE HISTORY

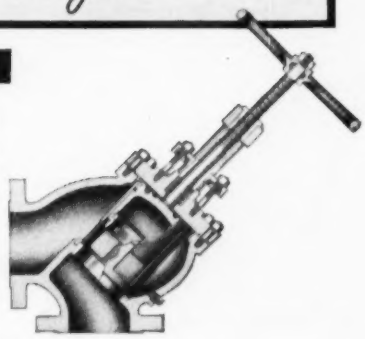
Thirty years' continuous service is by no means the record for Crane 250-Pound stop-check valves. But when 6 such valves, all installed in 1923, are still on the job, and still giving complete satisfaction, surely that's worthy of note. So well did these Crane No. 30E stop-checks perform right from the start, that 11 years later, in 1934, 2 more were put on boilers installed that year.

Here are 8 valves with a collective service record of more than 220 years. And in all that time, the only maintenance required was regrinding the seat of one valve.

It takes a lot of quality to deliver such valve performance with so little upkeep. That's why today, in face of rising maintenance cost, Crane quality is more than ever the first choice of the thrifty valve buyer.

THE VALVE

Simplicity and dependability are still the chief characteristics of Crane 250-Pound stop-check valves. They have just one moving part—the piston-type disc that operates in a removable liner, without chatter, vibration, or rapid wear. You'll have a safer power plant with these valves on your boilers, and they'll permit steam flow to the main header at minimum pressure drop. See your Crane Catalog or Crane Representative for complete information.



THE BETTER QUALITY...BIGGER VALUE LINE...IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

For more facts circle 572 on Reply Card

"Measured by the ton mile, Hercules Red-Strand preformed outlasts others about two to one," reports one operations manager. Another operator testifies, "Our records show Red-Strand is considerably out in front of four other ropes."

Why HERCULES Red-Strand excels

What's the reason for such performance and praise? In simple terms, it's because *higher-than-rated quality* in Red-Strand preformed delivers *longer-than-expected service.*

If you're not completely satisfied with *your* wire rope service, try Red-Strand preformed. You'll experience the difference too.

Be sure to get your free copy of valuable 64-page LESCHEN Wire Rope Handbook. Ask your nearby HERCULES® Red-Strand distributor... or write direct.

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LESCHEN
WIRE ROPE AND SLINGS

LESCHEN WIRE ROPE DIVISION • ST. LOUIS 12, MISSOURI
The Watson-Stillman Company
(A SUBSIDIARY OF H. K. PORTER COMPANY, INC.)

For more facts circle 573 on Reply Card

NEW PRODUCTS

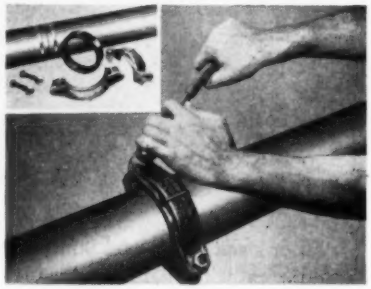
(Begins on page 132)

are available. Model A-1 uses abrasive belts up to 1-in. wide and weighs 2¼ lb. Model A-2 takes belts to 2-in. wide, weighs 2½ lb. Curtis Machine Corp.

7—COUPLING for grooved pipe, is light in weight

Gruvajoints are specifically designed to save time, weight, freight and space in coupling grooved pipe systems where pressures do not exceed 500 psi. The original cost is announced as about 15 per cent less than many grooved pipe couplings, and the weight about 40 per cent less. Because Gruvajoints are light and compact, they are easier to handle and store, company points out, and they can be installed in close quarters.

According to manufacturer, the new couplings automatically absorb expansion and contraction, shock, ground motion and vibration; they remain leakproof under end pulls up to 7500 lb; permit layout misalignment up to 3 deg; and withstand temperatures between -65 and 200 F. They can be applied or removed quickly and used again and again, and are suitable for permanent or temporary lines carrying air, vacuum, gases, water, oil, chemicals and pulverized minerals and rock.



A green rust inhibitor protects the surface of these malleable iron couplings; the sealing gasket is synthetic rubber. Gruvajoints come in 2-, 3- and 4-in. sizes. Gustin-Bacon Mfg. Co.

8—DUST COLLECTOR, cloth screen, is self cleaning

The Type CH-3 is a self-cleaning cloth screen dust collector designed to lower operating and maintenance costs by permitting continuous automatic dust collection, constant air volume and suction, and reverse flow cleaning of its cloth filters. This latter function is accomplished by a traveling manifold whose integral reverse air blowers take air directly from the clean air side.

In operation, the manifold covers three vertical rows of cloth-covered screen frames at once. The reverse flow of air is blown through the center row of screens while normal air flow through the other rows is blocked off by the flexible diaphragm on the manifold which is inflated against the grid wall under flow of pressure when

Peering at New Profits

The 'see it for yourself' approach is hard to beat when you want the real facts. This alert plant engineer sees new profits down his plant's stack.

New profits in terms of tons of valuable dust that can and should be returned to production rather than being wasted in the air.

Getting at those profits is our business! In one plant, for instance, Buell Engineers recovered over 200 tons of valuable dust in a single week. A clear example of the superior efficiency of Buell equipment. Just send in a sample of the dust, Buell Research can tell you how best to reclaim its value.

With these facts in hand, Buell has served dozens of America's Leading Companies. Why not send for the names of several in your own field?

Our informative brochure—The Collection and Recovery of Industrial Dusts—explains all three Buell systems of industrial dust recovery. For your complimentary copy, write Dept. 14-J, Buell Engineering Co., 70 Pine St., N. Y., N. Y.

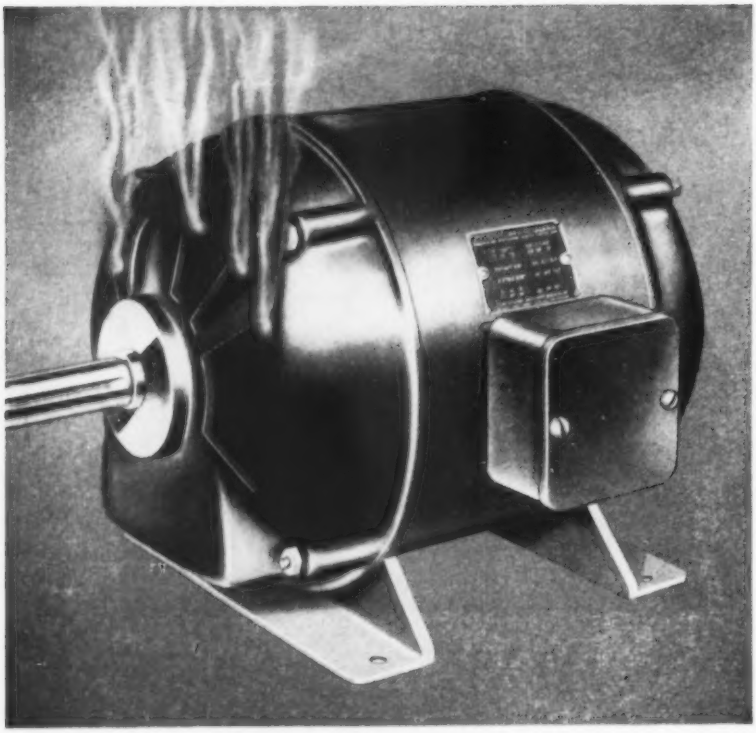
buell®

MECHANICAL ELECTRICAL

20 Years of Engineered Efficiency in

DUST RECOVERY SYSTEMS

For more facts circle 574 on Reply Card



You can avoid motor burnouts

THE temperature surrounding motor protection equipment is an important factor in motor burnouts. In order to prevent nuisance stoppages in hot weather, the rating of protective equipment is often raised. Then, when plant temperature drops, protection is inadequate . . . motors are more subject to burnout.

This explains why an ever-increasing number of plants are standardizing on HEINEMANN Circuit Breakers as manual motor controllers. Set tripping points of HEINEMANN Circuit Breakers *are completely independent of ambient temperature.* Moreover, HEINEMANN Circuit Breakers provide inverse time delay to permit starting inrush or harmless, temporary overloads . . . yet they provide the fastest circuit interruption available on large overloads, stalled rotors, single-phasing or short circuits.

HEINEMANN Circuit Breakers operate on a hydraulic-magnetic principle. They do not employ thermal elements or heaters. They are available with precise ratings to the motor, and are provided with time delay characteristics especially suited to trouble-free motor protection.

don't use heat ...USE POWER

Send for Bulletin 1410.

HEINEMANN ELECTRIC CO.

128 PLUM STREET • TRENTON 2, NEW JERSEY

For more facts circle 575 on Reply Card

NEW PRODUCTS

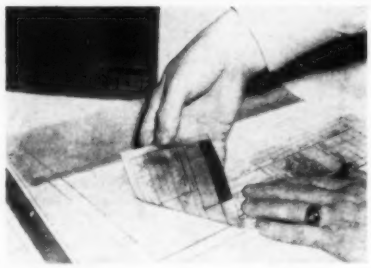
(Begins on page 132)

the blower unit is centered on a particular row. This mechanical arrangement causes dust to be blown from external surfaces of the filter elements, and lets it drop into the hopper instead of being entrained; it also acts to prevent air short circuiting.

The manifold travels at slow speeds in both forward and reverse motions. Because the collector operates continuously, there is no need for shut downs for mechanical cleaning, it is noted. And because dust accumulation on the cloth surfaces is maintained at a uniform value, the air flow resistance of the collector remains relatively constant. Pangborn Corp.

9—TRANSFERS save time on drawings and tracings

An improved line of Transeals, including title blocks, bill of materials, change blocks, technical symbols, is now available for use by engineers and draftsmen. Transeals consist of a thin transparent printed plastic sheet with a pressure-sensitive adhesive coating that is protected by a removable waxed



paper sheet. Use of Transeals eliminates a great deal of hand lettering, symbol drawing and ruling usually required for engineering drawings on paper, vellum or cloth. Furnished for application to either reverse side or face of the drawing, Transeals are applied by slight hand pressure, without heat, and they can be stored for future use. Johnson Research Corp.

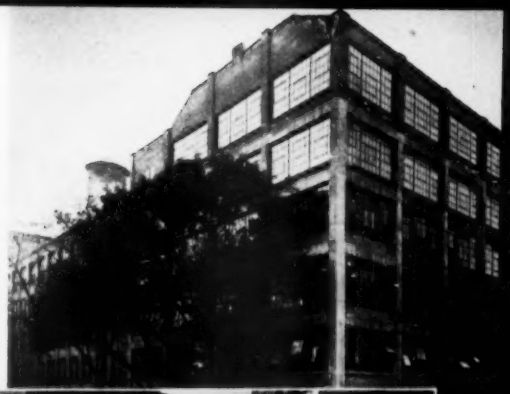
10—MANIFOLD VALVE controls pressure in reduced area

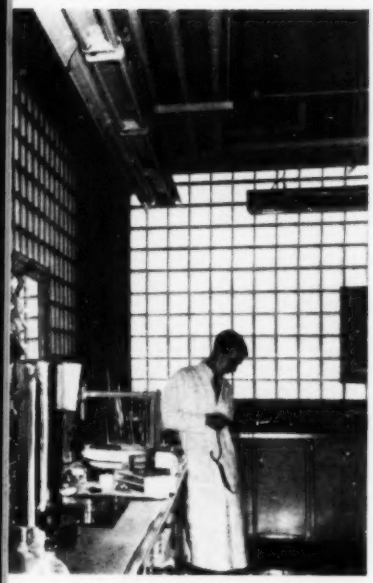
This air control manifold is designed to bring together into one compact unit a pressure regulator plus the accessory valves, pressure gage and fittings normally required to control the pressure in an air line. Introduced for use on mechanical presses to control air pressures on die cushions, counterbalance cylinders, clutches and brakes and similar devices, the new manifold is also said to offer advantages for many types of pneumatic circuits.

Essentially, the unit consists of a globe shut-off valve which admits the compressed air supply, an adjustable pressure regulator, a pressure gage protected from line fluctuations by a needle valve, a check valve and a globe ex-

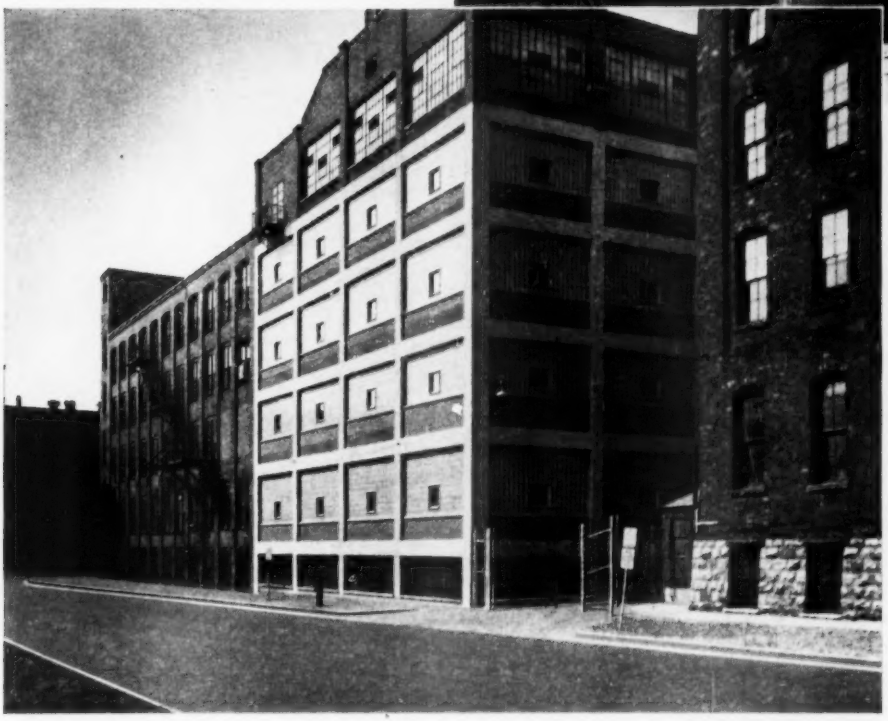
Before Daylight Engineering

(deteriorated sash plus high maintenance costs)



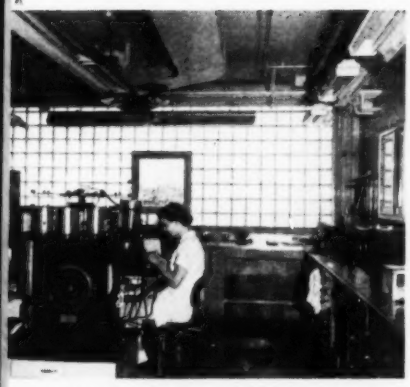


Control of room conditions is vital in the performance of critical laboratory experiments. Because of the excellent insulating properties of Insulux Glass Block, temperatures within each laboratory are easier to control



After Daylight Engineering

(A pleasant, cheerful atmosphere and no maintenance)



Abundant daylight is brought into the laboratories at all times of the day. And, because glass block has little affinity for dirt and dust, hospital-clean conditions prevail

WHEN the Upjohn Company, Kalamazoo, Michigan, transferred its pharmaceutical manufacturing operation to a new plant, it was decided to convert this 30-year-old building into laboratories devoted to the study of Pharmacology and Endocrinology.

One of the first problems that had to be solved was what to do about sash replacement. The original sash had deteriorated so badly it took continual, expensive maintenance to provide proper weather protection.

Since all of the laboratories were to be air-conditioned, Insulux Glass Block® was selected because it promised savings in operating expenses as well as economical installation costs. The glass block modernized the entire building exterior and brought it up to date, despite the actual building age.

If you are in the process of remodeling old structures or building new ones, don't overlook the positive advantages that panels of Insulux Glass Block bring. An experienced Daylight Engineer is ready to help you with your plans. Write Insulux Glass Block Division, Kimble Glass Company, Dept. PE-10, Box 1035, Toledo 1, Ohio.

KIMBLE GLASS COMPANY

Toledo 1, Ohio—*Subsidiary of Owens-Illinois Glass Company*

For more facts circle 576 on Reply Card

GREATEST → PERMANENT → MAGNET → NEWS → IN → YEARS

it's NEW! IT'S NEWS!

THE ERIEZ PERMANENT NON-ELECTRIC

GRATE MAGNET

BRINGS You "TRAMP IRON PROTECTION"

Never Before Possible!

The rugged ERIEZ Grate Magnet removes tramp iron from free flowing materials when installed in hoppers, floor openings, vertical closed chutes, etc.

ERIEZ Grate Magnets are available in 162 sizes, from 2½"x4" to 36½"x36". Here's protection to valuable equipment and a great help in preventing product contamination. Stops fires and explosions . . . *tramp iron can't get by!*

Look At These Features...

- Cadmium plated, hot rolled steel grill protects the magnets, slows and directs material stream onto all of the powerful magnetic tubes.
- Fast and easily cleaned . grill lifts off for easy access to smooth magnetic tubes.
- All sizes can be furnished entirely of stainless steel.
- Installation is fast and simple . . . no cutting or bolting necessary.

and a Companion

NEW . . . LOW COST . . . PERMANENT

HOPPER MAGNET

ADAPTABLE FOR INSTANT INSTALLATION IN MOST ANY SIZE SLOPE-SHAPED HOPPER!

The new ERIEZ Hopper Magnet affords needed protection never before available! Circle design of the unit makes it the simplest of all magnetic installations . . . merely lay it in the throat of any hopper, and while in this position it will grab and hold tramp iron from the free flowing material which passes through it! Constructed in 1" increments, the units can be had in any width.

•

Send for free bulletin B-204 fully describing these two new magnetic products.

ERIEZ MANUFACTURING COMPANY

15 Magnet Drive • Erie, Pennsylvania

"Buy Permanent Protection . . . by Eriez"

For more facts circle 577 on Reply Card

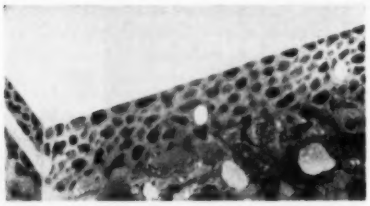
NEW PRODUCTS

(Begins on page 132)

haust. All are housed in one unit, which is only 10 in. from inlet to outlet. An important feature of the design is the use of special headers when more than one manifold is required. This arrangement further reduces fitting and installation costs, permits assembly in confined spaces and brings these controls to one central station. Headers come in two, four, six, and eight station units, and are declared suited for the addition of filters and lubricators. Danly Machine Specialties, Inc.

11—FLOORING can stand temperatures up to 2000 F

For use where temperatures range up to 2000 F, this industrial flooring is said to withstand thermal shock and not deteriorate from heat. The flooring disperses heat through aluminum rods



embedded about 1 in. below the surface, it is explained, and because of their high thermal conductivity these rods carry the heat from the contact area and spread it over a wide section of the floor. This resistance to heat and other wearing forces suggests its use for metal rolling mills, foundries.

Newest of the floorings developed by the manufacturer, this heat-resistant type utilizes Dynapakt Concrete. According to company, this concrete consists of hardest graded rock and sand combined with cements in low-water ratio and power compacted for greater density; it is designed to stand up under industrial traffic. Flash-Stone Co., Inc.

To receive product data circle item numbers on the handy Reader Service Cards on pages 35-36 and 185-186.

12—PIPE MARKERS are easy to remove from backing

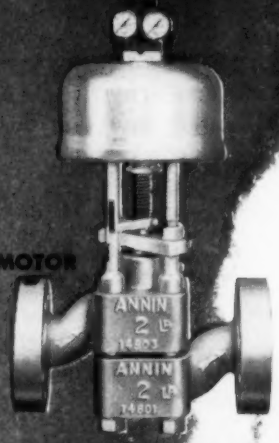
Applying even the largest sizes of this company's pipe markers and other markers is claimed effortless because of a new release coating used on their backing cards. You don't have to tug on the marker to pull it off the card. Manufacturer calls this coating the Blue Streak Chromatic Abhesive, coining the word "abhesive" (as the opposite of "adhesive") to describe a formula that decreases the tendency of materials to stick to each other. The abhesive coating is applied to the backing card over

REACHING FOR NEW HIGHS

Annin's superiority comes from the rugged proving grounds of guided missile work, where simple valve design, rugged construction and dependable operation are the factors that count. From this beginning Annin research and engineering have constantly reached for "new highs" in efficient control of difficult fluids under extreme conditions of pressure and temperature. This experience can now be applied in solving YOUR high pressure problems with these new standard model Annin Domotor, Cylinder and Handwheel operated valves. Pressure and temperature ratings of 6000 psi (standard*) and —325° F to 1200° F. Like all Annin models they offer flexibility in operation, bubble-tight shut-off, reduction in valve inventory and low maintenance cost. Get the facts today on ANNIN's work in the high pressure field, and what this experience can mean to you in savings and service.

*Special valves now in production to 30,000 psi

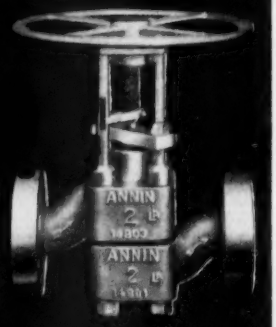
DOMOTOR



Model 2560, series 90-150, pressures to 3600 psi; temperatures —325° F to 1200° F.
Model 3560, series 250, to 6000 psi.

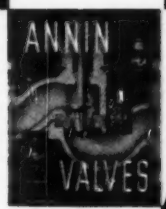
CYLINDER

Model 2520, series 90-150, pressures to 3600 psi; temperatures —325° F to 1200° F.
Model 3560, series 250 to 6000 psi.



Model 25, series 90-150, pressures to 3600 psi; temperatures from —325° F to 1200° F.
Model 35, series 250, to 6000 psi.

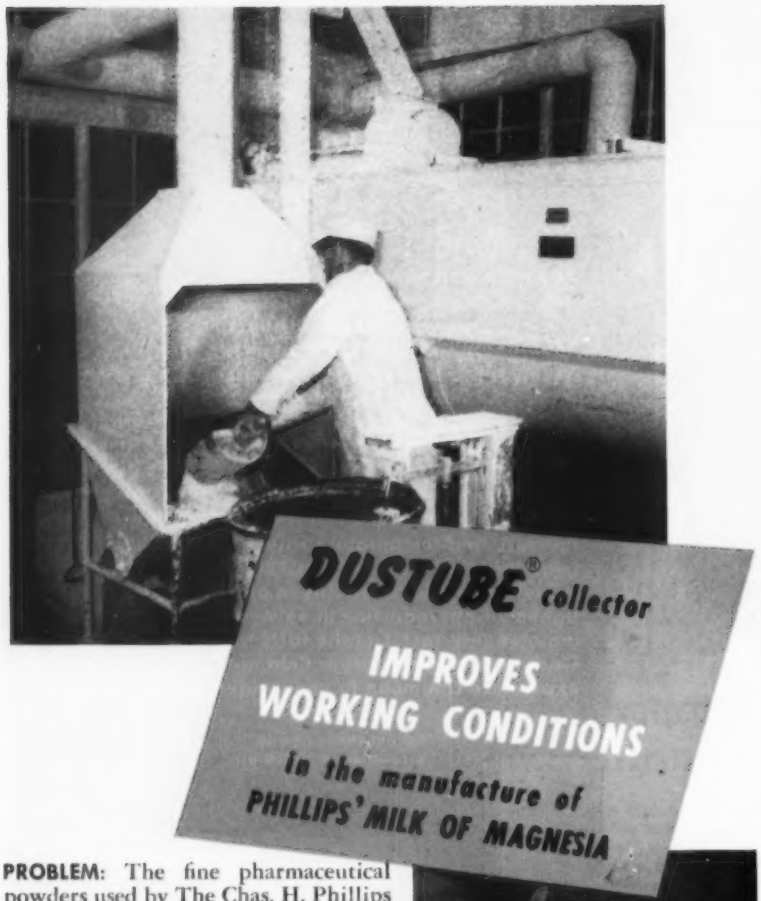
WRITE TODAY
for illustrated bulletin showing how and why Annin offers the best buy in control valves.



THE ANNIN COMPANY
3500 UNION AVENUE, LOS ANGELES 23, CALIFORNIA

ANNIN Control VALVES

For more facts circle 578 on Reply Card



PROBLEM: The fine pharmaceutical powders used by The Chas. H. Phillips Co., Div. of Sterling Drug, Inc., created a serious dust problem in the tablet making and packaging room operations. The dust laden air settled throughout the room—a source of annoyance to the workers plus increasing plant housekeeping efforts and decreasing efficiency of the necessary air conditioning system.

SOLUTION: A high efficiency Dustube cloth-tube-type dust collector was installed to ventilate all mixing, tableting and packaging operations in processing Milk of Magnesia.

RESULTS: In the words of Mr. R. Ross Kitchen, Plant Manager, "The Dustube Collector has proved satisfactory from the standpoint of improved working conditions, reduced cleaning of department and a definite lengthening of the life of the air-conditioning system. (Time required to clean this unit reduced 75%—man hours from 21 to 5 hours)" Such outstanding performance is not unusual. It's the kind of efficiency and operating economy that may be expected from Dustube Collectors. Get the facts about what they can do on your dust or fume job.

Send today for Bulletin 372 and the address of your nearest Dustube field engineer.

American® WHEELABRATOR & EQUIPMENT CORP. dustube® COLLECTORS

839 S. Byrkit Street, Mishawaka, Indiana

For more facts circle 579 on Reply Card

NEW PRODUCTS

(Begins on page 132)

the same area as the marker. It is rendered inert, so as not to affect the pressure sensitive adhesive on the marker itself.

The new coated cards will be used on wire markers, pipe and conduit markers, safety signs, fluid like markers, write-on labels and special markers. Literature on them and a sample are offered. W. H. Brady Co.

13—VIBRATING CONVEYORS for special conveying jobs

Oscilveyors are designed for handling materials which must be transported within a closed housing and which are not readily handled by other types of conveyors. This new type of vibrating conveyor oscilates with a continuing series of forward-and-up, downward-and-back movements. It moves material by throwing it forward short distances in making its cycle.

The number of vibrations per minute and the forward throw are critical factors in handling different materials, company points out, and for this reason an experimental laboratory is maintained for testing materials to determine the correct design for the product in question. Gifford-Wood Co.

14—CONTROL THERMOMETER offers low unit cost

This indicating pneumatic control thermometer is available with either direct or reverse acting "on-off" or limited throttler control units. Actuation is provided by standard vapor or mercury-filled thermal systems. According to company, this controller is suitable for providing automatic control advantages to manually regulated processes.

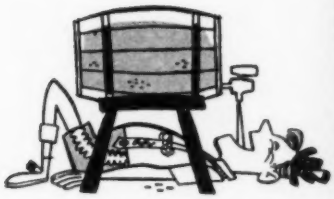
The compact, 11-by-11-by-4 in. instrument is housed in a black aluminum case with black phenolic cover. Three reversible mounting clamps permit interchangeable flush or surface mounting on panels of any thickness. Bulletin 6401 describes the unit. Industrial Div., Minneapolis-Honeywell Regulator Co.

15—WALL TILES feature beauty and greater durability

So processed that they can be made in an unusual variety of colors and designs, Aztec Wall Tiles are announced as lighter, stronger and more durable than other types of tile. And their manufacturer says they will cost less than many tiles. In making these tiles, heavy layers of special paper are welded together with synthetic resins into a substance claimed to be as hard as mild steel and so smooth and tough it won't chip or crack. This surface is further described as chemically inert, resistant to every known type of acid and practically impossible to break under normal conditions.

The most important advantage of the new tile, according to manufacturer, is the number of colors and patterns pos-

SAVE DOWN TIME...ALL THE TIME!



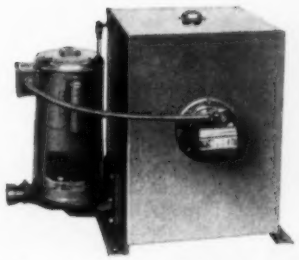
"Low return lines"

"Only one principal moving part"

With Dunham Vacuum Pumps you don't have to waste time or money making frequent adjustments or replacing worn parts. After installing them . . . you virtually forget 'em, except for occasional routine maintenance.

Since there's *only one* principal moving part . . . and no close clearance parts . . . these pumps continue to pull and maintain up to 26" vacuum—and do it for years without repairs. Single motor, mounted high and dry, easily handles *both* air and condensate removal.

Dunham Pumps are easy to install, too. With return line connections at such low level, 9⅛", there's no need for expensive "pitting." Three anchor bolts hold it fast. Full range of sizes and types, both single and duplex models. For complete information, clip and mail the coupon.



Dunham Condensate Pumps assure fast, positive condensate removal. Mechanical seal eliminates stuffing box maintenance. New low cost. Completely wired for immediate use. Side-mounted motors. Anchor bolts secure pump to floor. Single and Duplex models.

DUNHAM VACUUM PUMPS

RADIATION • UNIT HEATERS • PUMPS • SPECIALTIES

QUALITY FIRST FOR FIFTY YEARS

C. A. DUNHAM COMPANY • CHICAGO • TORONTO • LONDON

C. A. DUNHAM COMPANY
Dept. PE-10, 400 W. Madison St.,
Chicago 6, Illinois
Please send Pump Bulletin.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

For more facts circle 580 on Reply Card

THE FACTS OF

LIGHT

...AND THOMPSON METAL POLE UNITS

FACT NO. 1: Modern park-site type plants are designed for appearance as well as efficiency. In keeping with this trend, THOMPSON now offers an exclusive new Metal Pole Unit that features streamlined beauty and assures peak lighting efficiency at all times.

FACT NO. 2: Only THOMPSON Metal Pole Units incorporate a patented disconnecting and lowering mechanism that permits rapid . . . safe . . . efficient ground-level luminaire servicing by one man.

FACT NO. 3: THOMPSON Metal Pole Units eliminate all maintenance hazards. No ladders, scaffolding or lifts are needed for luminaire servicing . . . luminaires can be quickly lowered, relamped and cleaned, and then repositioned from the ground. Electrical dangers are eliminated because lowered fixtures are 'dead'.

FACT NO. 4: THOMPSON Metal Pole Units facilitate low-cost maintenance by saving man hours . . . reducing accidents. Pole-mounted luminaires now can be serviced at a fraction of normal time and cost.

THE THOMPSON ELECTRIC CO.

1165 POWER AVENUE • CLEVELAND 14, OHIO

For more facts circle 581 on Reply Card

NEW PRODUCTS

(Begins on page 132)

sible. The top layer in each tile is the "cover sheet" which gives the tile its color and design. Thus, anything that can be printed, drawn or otherwise reproduced can be captured in the tile through the use of the proper "cover sheet." Aztec Wall Tile is to be made in the usual 4½-in. squares as well as in 9-in. square plaques for paneling larger rooms. Technical data and literature will be furnished by manufacturer. Aztec Corp.

16—FANNER MAGNET for feeding the sheet steel

This fanner magnet is designed to separate oily sheets without prying, lift polished or painted sheets without scratching, prevent double feed, provide operator safety, and handle irregular shapes. It comes in four strengths, and in 6-, 9-, and 12-in. sizes for handling light sheets from 22 gage to ¼ in. plate.

Its construction incorporates Alnico V plate magnets mounted on an aluminum L bracket, so that pole plates and air gap are vertical. Stainless steel anti-friction guides on the face of the L bracket accommodate sheets as small as 4 in. wide.

As shown in this punch press installation, the unit is fastened to the surface supporting the pile of sheets, which are

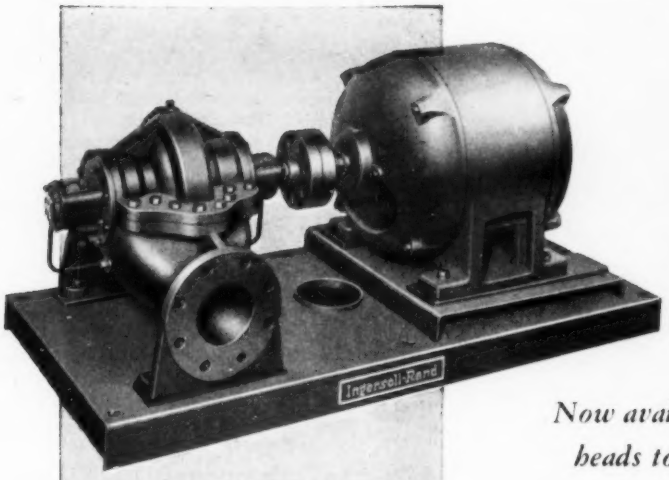
placed beside it. North and south poles induce a flow of like poles in the sheets, which immediately repel each other, it is explained, causing the sheets to be lifted or made so light they rise at slight touch. As one sheet is removed, the next stands up.

Company points out that the thicker the metal the larger the magnet required. Larger applications may call for fanner magnets on both sides of the pile, or at all four corners. It is claimed that sheets being handled are not permanently magnetized, unless of medium or high carbon content. A feature of the unit is sealed castings, which serve to prevent iron accumulations. Eriez Mfg. Co.

17—SWEEPER can clean up to two acres an hour

Reported to sweep over 100,000 sq ft per hour in open areas, the Model 75 also features fast mechanical dumping. With a few turns of a ratchet-type lever, the operator can dump loads weighing up to 700 lb, says manufac-

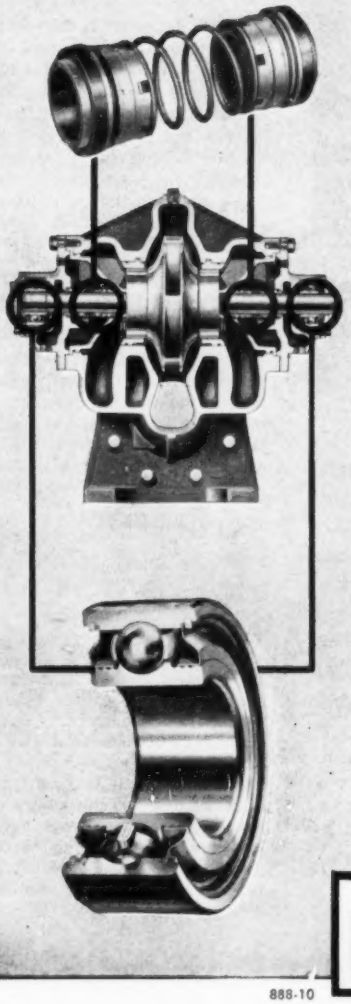
ELIMINATE MAINTENANCE PROBLEMS



with
Ingersoll-Rand

DMV
PUMPS

Now available for general hydraulic service heads to 300 ft.—capacities to 1900 gpm



888-10

NO STUFFING BOX ATTENTION

There are no packed stuffing boxes in the new DMV pumps. No periodic adjustment—no repacking—no annoying leaks. Double Mechanical Shaft Seals are *standard equipment* with water pumps. These performance-proved mechanical seals are self-adjusting—require no attention for the entire service life of their sealing faces. Replacement, when needed, is greatly simplified by easily accessible seal-box extensions. Double seals give better pump performance under suction lift, too—and last longer on gritty-liquid service.

NO BEARING LUBRICATION

Greasing or oiling of pump bearings is a thing of the past. The DMV uses modern, cartridge-type ball bearings with the lubricant *permanently sealed in*. Sealed bearings of this same type have operated successfully and without attention for periods of more than 11 years in tough service!

Now you can put an end to the care and nursing of outdated pumps. The DMV line gives you a pump that can be installed anywhere with complete confidence. Maintenance requirements are practically zero. And the simple, accessible design saves on spare parts inventory—cuts costly down-time.

Call your nearest I-R branch office for the full story. Or write for Bulletin 7248.

Ingersoll-Rand
Cameron Pump Division
11 Broadway, New York 4, N. Y.

COMPRESSORS • GAS & DIESEL ENGINES • AIR & ELECTRIC TOOLS • ROCK DRILLS • VACUUM EQUIPMENT • TURBO-BLOWERS

For more facts circle 582 on Reply Card

SLY PIONEERS and LEADERS in INDUSTRIAL DUST CONTROL

Sly Unit Dust Filter at Rittman (O.) Plant.

Hooded enclosures at dust source, connected by ducts to the Sly Dust Filter.

IF IT'S DUST IT'S SLY

If your processing involves dust, what the Morton Salt Co. has accomplished will be of interest to you.

Three years ago at one of its mills, this company had a serious dust problem — and installed a Sly Unit Filter. The equipment has proved entirely satisfactory in cleaning up the plant and improving its appearance.

Since then the Morton Salt Co. has made Sly installations at five other plants — not only Unit Filters but also the larger standard Filters including the Sly Dynaclone. These Filters are handling salt and similar dusts from conveying, screening, blending, and packaging operations.

In industries where collected dust is high in value, such as pigments, metallic and non-metallic minerals, Sly Dust Control not only cleans up the plant but also saves thousands of dollars yearly in value of collected dust.

Regardless of what you make, if you have a dust problem, our long experience in collecting all kinds of dusts can be of value to you in cleaning up the plant and effecting savings — *which frequently repay, in a relatively short time, the cost of the equipment.*

May we send you Bulletin 98, full of helpful information on dust control? *If it's DUST, it's SLY.*

THE W. W. SLY MANUFACTURING CO.

4600 TRAIN AVENUE • CLEVELAND 2, OHIO

New York • Chicago • Philadelphia • Syracuse • Detroit • Buffalo
Cincinnati • St. Louis • Minneapolis • Birmingham • Los Angeles • Toronto

For more facts circle 583 on Reply Card

NEW PRODUCTS

(Begins on page 132)

turer, and it takes about half a minute to do it. The machine is designed to sweep a 36-in. path and pick up the dirt and litter at speeds up to 6 mph. A rotary side-brush increases the sweeping path to 48 in. and allows cleaning flush with walls.

Sweeping is said to be practically dust-free. The 36-in. brush, rotating inside a vacuumized compartment hurls heavy debris and dust into a 9 cu ft hopper. At the same time, a vacuum fan sucks lighter dirt and dust in a fabric bag. The brush compartment is "sealed to the floor" by a flexible rubber skirt so dust doesn't escape.

The sweeper is designed for easy handling in congested areas; it has automotive type steering, and an internal emergency brake for parking on inclines. It's powered by a 7.3 hp gas engine. G. H. Tennant Co.

18—REPAIR KIT to keep V-belts in working condition

Anyone can replace broken V-belts without dismantling machinery by using the Zipon Emergency V-Belt Kit, manufacturer announces. Each kit contains a planned footage of detachable V link belting, a simplified tool for attaching, and a folder of instructions. Company says that with the four kits of various size belting, you can replace all FHP and most multiple V-belts. Brammer Corp.

19—OPEN-END WRENCH fits into those tight spots

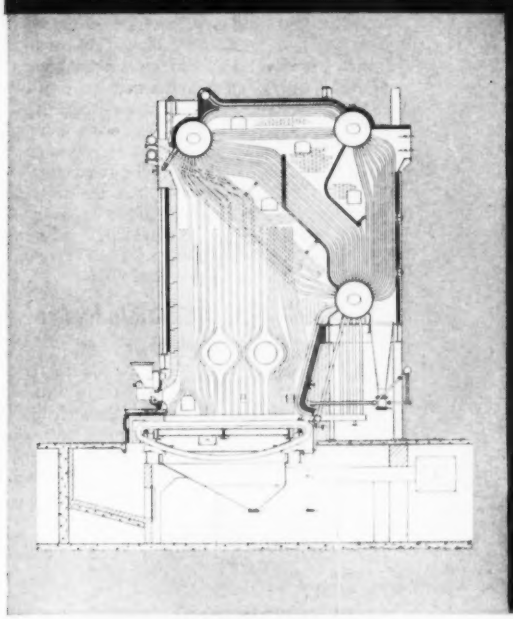
The Wedg-Head Wrench fits into tight corners, against walls and over obstructions, manufacturer announces. The head of this wrench has wedge-shaped jaws and is narrower in width to permit a good grip on nuts. And because

the head is angled, it takes solid bites on thin square or hex shaped nuts, it is pointed out, permitting the wrench to clear obstructions without skinning knuckles. A hollow dome inside the head is designed to give full jaw grip at all angles. Wrenches are made from heat-treated alloy steel and available in three sizes: 7/16 to ½ in., 9/16 to ⅝ in., and ¾ to ⅞ in. A leatherette roll is also available for the set of wrenches. Blackhawk Mfg. Co.

20—FORK-LIFTS feature modern styling, accessibility

These trucks are rated a 7500-lb capacity at a 24-in. load center and come in four standard lift heights from 72

10,000 People are proud of their UTILITY



BOILER DATA

2—E.C. 3-drum—80,000 lbs./hr.—750°F (TT)—399 lbs. O.P.—425 lbs. D.P.—water cooled side and rear walls—Erie City "Travagrate" Spreader Stoker with 12,000 B.t.u. Illinois coal and gas firing.

An Outstanding Record of Performance

1930—All Rates Reduced
1931—Power Rates Reduced
1932—Commercial Rates Reduced (Lights)
1933—Water Rates Reduced
1934—All Rates Reduced
1936—Power and Resident Light Rates Reduced
1940—Commercial Light and Power Rates Reduced
1943—All Electric and Steam Heat Rates Reduced
1945—All Electric Rates Reduced
1949—Increased costs forced 10% increase in all rates

The City of Fairmont, Minnesota, population 10,000, operates its own light, power, water and low pressure commercial steam heating services. The power plant, rebuilt in 1920, houses one 40,000 and one 60,000 pound boiler and two 80,000 pound per hour Erie City 3-drum steam generators added in the past five years. Its kwh generated has increased from 1.8 to 34.6 million in 1951.

The late G. E. Basom, had devoted 28 years to the careful management of this utility. Its outstanding record of rate reduction over the years is a monument to his devotion to the public trust. It is also a matter of great pride to this community that not one cent of taxes was required for financing their utility.

We are proud to have Erie City "Travagrate" Spreader fired Erie City 3-drum steam generators serving the City of Fairmont.

You can depend on Erie City for sound engineering

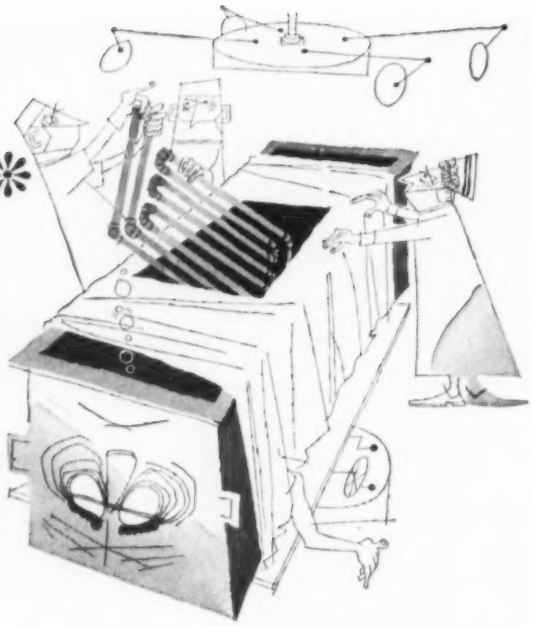
ERIE CITY
112 Years in Steam Generation

ERIE CITY IRON WORKS • *Erie, Pa.*

STEAM GENERATORS • SUPERHEATERS • ECONOMIZERS • AIR PREHEATERS
UNDERFEED AND SPREADER STOKERS • PULVERIZERS

For more facts circle 584 on Reply Card

has
coil-itis*
got you
constantly
doctoring
your
tanks?



Like the human appendix, pipe coils often give constant trouble until they are removed and replaced with Platecoils. Immediately, you will notice the difference as Platecoils put new life and profits into your heat transfer processes. They heat or cool 50% faster. They take 50% less space in the tank leaving room for greater payload. Platecoils overcome the limitations and operating difficulties of old fashioned and outmoded pipe coils to save hours of downtime.

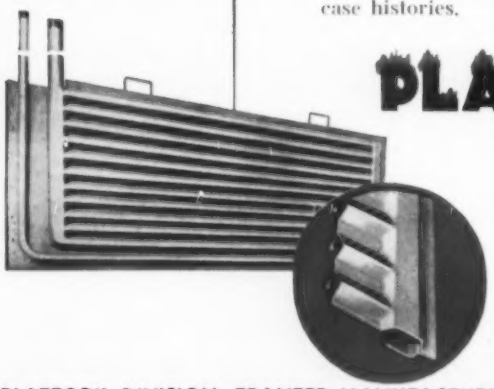
It costs less to cure coil-itis with Platecoils than to suffer its evils.

Write for Bulletin P80 today!

PLATECOILS SAVE 50% IN HEAT TRANSFER COSTS

PLATECOILS REQUIRE 90% LESS CLEANING

At Motor Wheel Corporation cleaning time has been cut from 10 hours per pipe coil every 60 days to only one hour per Platecoil. Ask about other case histories.



PLATECOIL

REPLACES PIPE COILS

Coil-itis — Diagnosed as tank heating and cooling problems. Platecoils — the prescription for solving pipe coil problems.

PLATECOIL DIVISION, TRANTER MANUFACTURING inc., Lansing 4, Mich.

For more facts circle 585 on Reply Card

NEW PRODUCTS

(Begins on page 132)

in. to 114 in. The Model FT75-24 is powered by a heavy-duty gasoline engine; the FTD75-24 is diesel powered.

Modernly styled, the trucks have a "wide-open" design in which all side panels, rear and top, can be removed for quick accessibility. They are provided with a 12-in. dia industrial type clutch which can be changed in about 30 min. Other features announced include a single lever full range gear shift and center point automotive steering. The units can be equipped with cushioned or solid rubber tires. The truck (less forks) is 100½ in. long, 42 in. wide and has a wheel base of 60 in. It is designed to turn in a 77¼ in. intersecting aisle. The Buda Co.

21—DUST COLLECTOR is hydro-static precipitator

The Design 4, Type N Roto-Clone is described as an improved hydro-static precipitator that separates dust from the air by means of an S-shaped water curtain, which is reported highly effective in collecting most types of process

dust. It is available in three basic arrangements, identical in operating principle, but differing in hopper design and means of sludge removal. The three arrangements provide manual cleanout, continuous drain and sludge ejection by flight conveyors.

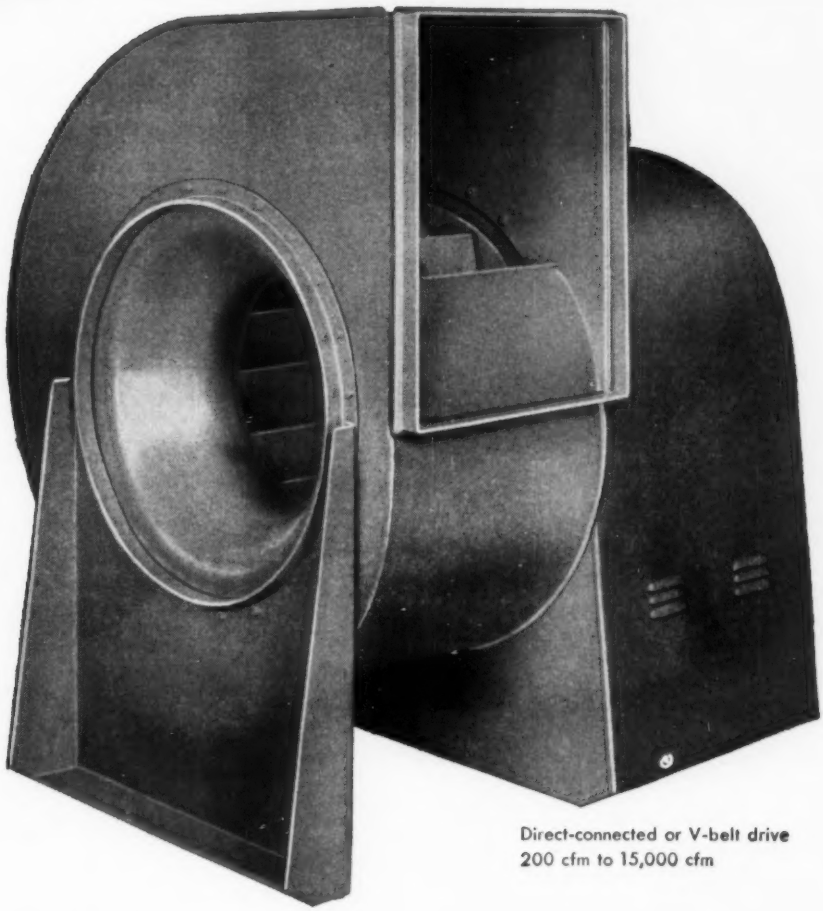
Improved features announced for the collector include non-plugging water entrainment separators; heavier sludge ejector mechanism; wide range of sizes and capacities, and sectional construction to permit conversion from one arrangement to another. Sizes for capacities from 1000 cfm to 48,000 cfm are available. Full details are given in Bulletin 277. American Air Filter Co., Inc.

22—AIR RELEASE and air inlet valve for pipe systems

The Type AV Air Release and Vacuum Breaking Valve is designed to provide a compact unit having the functions of automatically releasing air accumulations from pipe systems, admitting air to systems for breaking vacuums within these systems, and venting large quantities of air from pipe lines when filling systems with water. Company says it

NEW!

ALL-PURPOSE VENTILATING SETS YOU CAN PUT INTO SERVICE FAST!



Direct-connected or V-belt drive
200 cfm to 15,000 cfm

Here's a new line of Westinghouse motor-driven ventilating sets. They are ideal for general purpose ventilation, for exhaust, for processes, and for removal of heat, fumes and vapor.

Where changing plant or building conditions create an unexpected need for ventilation, these sets are a quick solution. Here's why:

COMPACT SIZES—down to 10" x 12" x 16"—take little space, are easy to install.

SINGLE UNIT—fan, motor and drive all made and assembled by Westinghouse.

DIRECTION OF DISCHARGE—can be changed on the job.

LOW MAINTENANCE permits use of out-of-the-way locations.

WEATHERPROOF COVERS permit outside installation.

SHORT DELIVERIES get your job started sooner.

These ventilating sets are low in first cost, low in operating cost. You get a single warranty because fan and motor are both built by Westinghouse.

For other exclusive features and full information, ask for Catalog 1160. Call your local Westinghouse-Sturtevant office. Or, write Westinghouse Electric Corporation, Sturtevant Division, Hyde Park 36, Massachusetts.

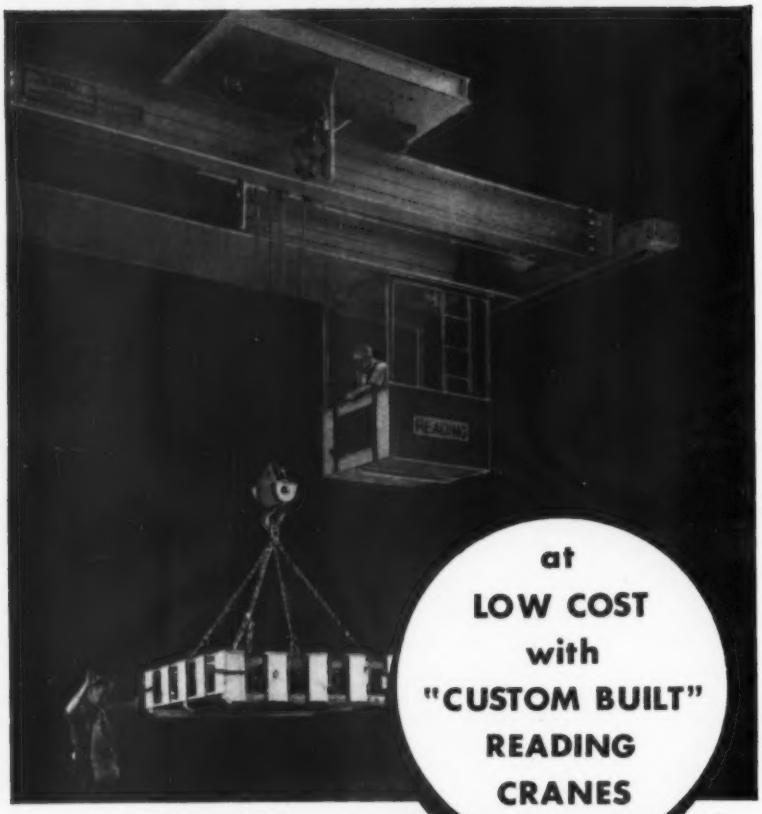
WESTINGHOUSE AIR HANDLING

J-80317

YOU CAN BE SURE ... IF IT'S Westinghouse

For more facts circle 586 on Reply Card

How to speed Materials Handling...



This crane was engineered to the needs of the job —span, lift, crane drive, trolley drive, hoisting speed —from *standard* READING CRANE units *at no extra cost!*

● How often have you wanted a crane that would . . . cost less . . . speed materials handling . . . reduce maintenance costs . . . and meet all the requirements of your job?

When a READING CRANE is installed in your plant, you get a crane CUSTOM BUILT to fit your operations—at no added engineering cost. This unique UNIT DESIGN offers you a choice of several interchangeable motor, trolley and hoisting units. You reduce maintenance dollars because any unit can be removed for repair without dismantling other units. You buy no "extras" for special handling jobs; your READING CRANE is "tailor made" to your specifications.

For the kind of handling results you're looking for, get in touch with READING right away. At no obligation, one of our engineers will gladly analyze your operations and give you a practical, money-saving recommendation.

Reading Crane & Hoist Corporation, 2103 Adams St., Reading, Pa.

READING CRANES

CHAIN HOISTS | OVERHEAD TRAVELING CRANES | ELECTRIC HOISTS

For more facts circle 587 on Reply Card

NEW PRODUCTS

(Begins on page 132)

is constructed to combine these three functions and permit the intake and exhaust of air through one valve body. Since it has a 2-in. threaded inlet opening, it provides a smaller unit than ordinarily furnished for vacuum breaking purposes, it is noted; and because of its size it can be installed in confined quarters.

This form of valve is suggested for use under working pressures to 150 psi wherever air accumulations are found in pipe lines, and where difficulty of water flow is experienced due to air binding. The valve is 11½ in. dia, 16¼ in. high; it weighs 160 lb. Simplex Valve & Meter Co.

23—CONVEX MIRROR to make blind corners safer

A new addition to this company's Klear-Vu line of industrial mirrors, this 24-in. convex glass mirror is designed for use where blind corners, cross aisle intersections, entrances and exits present traffic hazards. When installed in these locations at a height of 8 to 10 ft, this mirror is said to reflect, for considerable distance, the moving of oncoming traffic from opposite directions. The mirror head is supported with a 3-in. swivel stud assembly and mounting assembly to permit easy installation and adjustment. Lester L. Brossard Co.

It's easy to obtain product data with the postage-free Reader Service Cards on pages 35-36 and 185-186. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

24—THERMOSTAT to prevent temperature overshoots

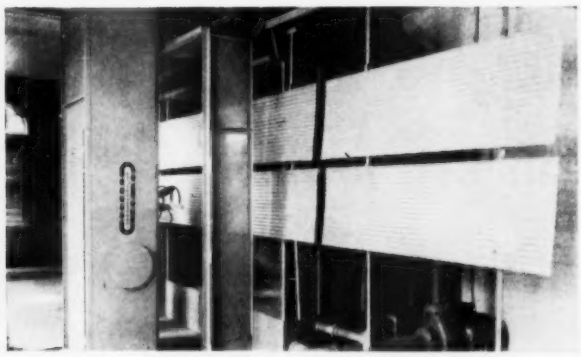
Here's a rate-of-rise thermostat designed to control the rate of heating and prevent hazardous temperature overshoots in fast warm-up systems. Controls of this type are also suggested for monitoring processes in which heating rate must be controlled or temperature overshoots from a rapid heating cycle prevented.

The rate-of-rise thermostat unit may be used standard temperature controls, or as a separate safety control. When used in series with a temperature controller, the rate-of-rise unit is designed to bring the system up to temperature from a "cold" start, at desired rate. After the controlled warm-up period, the standard temperature controller takes over and the rate-of-rise unit becomes a safety check. It may also be used separately as a safety limit switch to shut down a process or machine where excessive rates of tem-

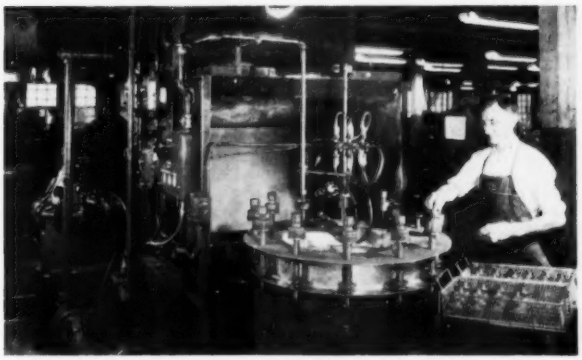
Is automatic painting your next step to lower production costs?

DeVilbiss Automatic Spray Machines cut finishing costs as much as 2/3 and reduce rejects to a negligible number for manufacturers of household appliances, building materials, industrial equipment, soft goods and thousands of other mass-produced items.

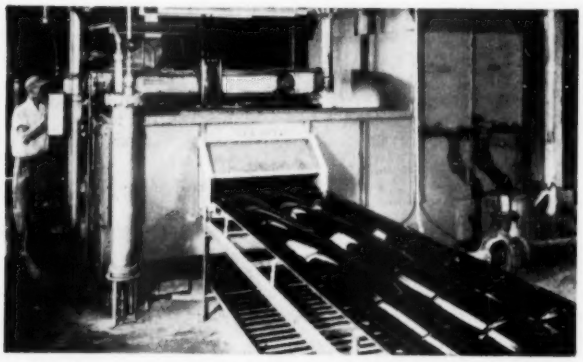
Vacuum cleaner housings like these are typical of the parts that can be finished automatically at rates from 540 to 4320 pieces per hour on DeVilbiss Chain-on-Edge Machines.



Parts traveling on overhead conveyors, such as these panels, can be quickly coated both front and back with any material on DeVilbiss Automatic Vertical Transverse Machines.



DeVilbiss Automatic Rotary Machines spray a great variety of industrial products economically and quickly, with absolute uniformity. The operator need only load and unload the table conveyor.



Coating speeds from 3,000 to 14,000 square feet per hour are possible with DeVilbiss Automatic Horizontal Transverse Machines. Here, carpet-sweeper tops emerge with a gleaming finish.

How about *your* company? Is there a job out in the shop that could benefit from the high speed, the smooth, uniform finishes DeVilbiss Automatic spray-painting equipment brings about? Whether you're working with flat objects, parts traveling on overhead conveyors or parts that require both inner and outer coatings, you'll find DeVilbiss has a wide variety of standardized automatic machines to serve you. Call your local DeVilbiss representative for full details.

THE DEVILBISS COMPANY, Toledo, Ohio

Windsor, Ontario • London, England • Santa Clara, Calif.

FOR BETTER SERVICE, BUY

DEVILBISS

Branch Offices and Distributors in Principal Cities Throughout the United States, Canada and the World

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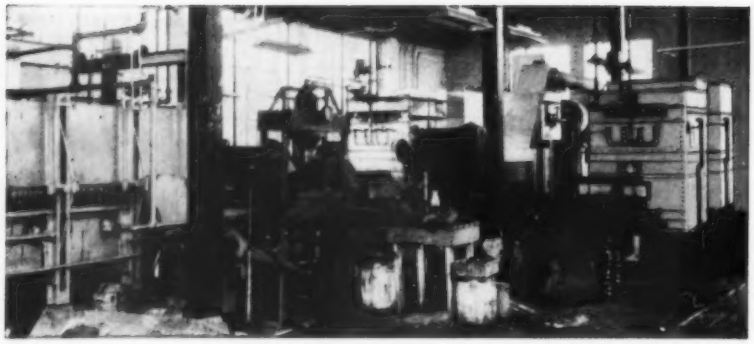

Niagara Aero Heat Exchanger quickly pulls down the initial peak load of heat in quenching . . . and saves cooling water

Accurate control of quench bath temperatures and quickly effective capacity to handle the initial peak load of heat in quenching prevents production set-backs, increases the output of your heat treating department, prevents oil fires, saves you losses from rejected parts.

Niagara Aero Heat Exchangers give you this control in both furnace and induction hardening methods. They prevent both over-heating and over-cooling of the quench bath. Hundreds of heat treaters know they prevent many troubles, constantly improve quality and increase production.

They quickly pay for themselves by saving cooling water coils and extend your quench capacity without extra water or cooling tower.

Write for Bulletin #120 giving complete information.

NIAGARA BLOWER COMPANY

Over 35 Years' Service in Industrial Air Engineering

405 Lexington Ave. **New York 17, N. Y.**

Experienced District Engineers in all Principal Cities

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NEW PRODUCTS

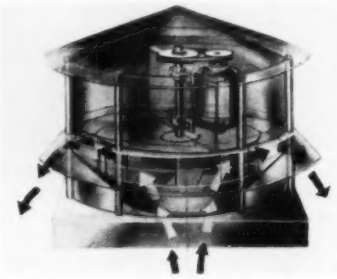
(Begins on page 132)

perature indicate an abnormal, hazardous condition.

Company's Thermoswitch incorporated is adjustable to control heating rates between 10 and 100 F per minute. The unit is hermetically sealed, can be used in ambient temperatures between -100 and 550 F. It weighs less than ¼ lb and is ⅝ in diameter. The electrical rating is 5 amp at 115 v a-c, or 2 amp at 28 v d-c. Fenwal Inc.

25—POWER ROOF EXHAUSTER for industrial ventilation

Many industrial ventilation processes requiring high slot velocities are within the range of these belt-driven power roof exhausters, it is announced. They are designed to develop up to 4 in. static pressure and up to 65,000 cfm.



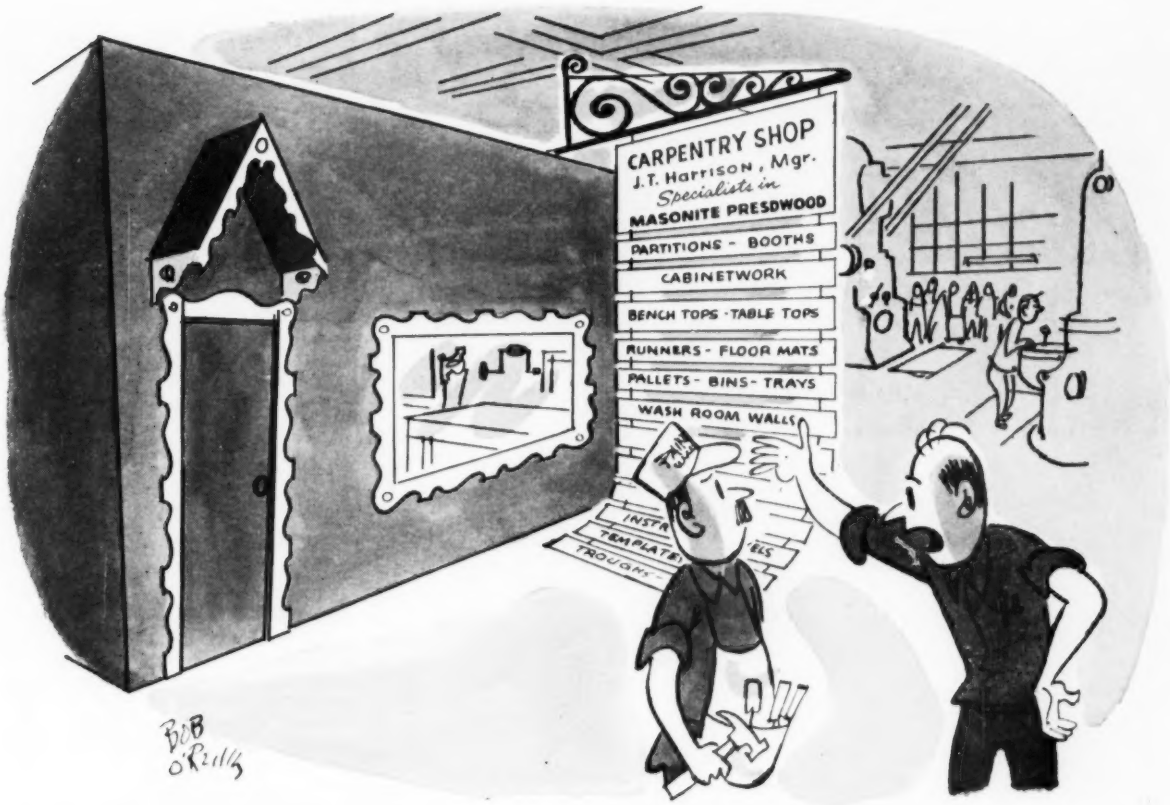
This performance is said to be due to the incorporation of company's scroll effect for centrifugal power roof exhausters. The new unit has an air seal designed to develop a negative air pressure around the motor shaft and prevent explosive or corrosive fumes from entering the motor housing. It has an umbrella type outlet, backwardly curved centrifugal fan wheels. Prices and data are offered. The Gallaher Co.

26—SPROCKET CHAINS for drives, conveyor belts

Announced as the R, RX and RR Series, these chains replace and supplement a group of popular sizes in manufacturer's Rex Chabelco line of steel chains. The R and RX series are drive chains, and the RR are conveyor chains. According to company, the area of improvement includes controlled material selection and heat treatment to provide increased wear resistance and strength; closer planned tolerances of press fits for smooth operation; easier assembly and disassembly. The chains operate on standard sprockets. Chain Belt Co.

27—SAFETY SWITCHES have special industry enclosures

NEMA XII Safety Switches—designed for machine tool and processing industries and for plants requiring a switch that will exclude dust, dirt, oil and coolants—are announced. The box is formed and welded from heavy code gage steel; and the cover, sealed by a



"Yes, Jerry, I'm glad you like **MASONITE PRESDWOOD,** *but after all..."*

all through the plant...

MASONITE PRESDWOOD

solves maintenance problems!

You can't blame a man for trying. Once he gets acquainted with Masonite Presdwood and learns how many different jobs it can do better . . . it's hard not to be enthusiastic.

Especially when you realize that there are so many different types and thicknesses for doing so many jobs better. Tempered and standard panels, panels smooth on both sides, textured panels—there are 33 varieties in all.

Our free booklet will guide you to greater maintenance economies with these versatile all-wood hardboards. Send the coupon today. Then stop in at your local building materials dealer for the type and thickness of Masonite Presdwood® you need.

BETTER HARDBOARDS FOR BETTER MAINTENANCE

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Please send me your brochure on "How to Improve Factory Methods with Masonite Presdwood."

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"Masonite" signifies that Masonite Corporation is the source of the product

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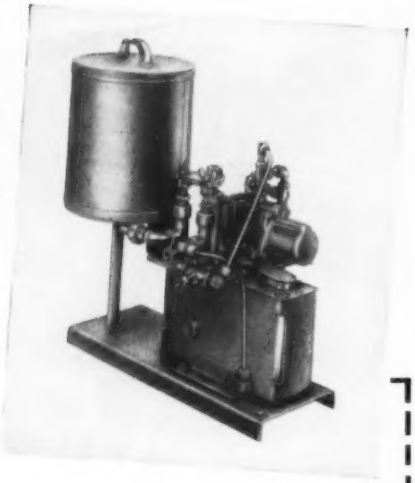
Make SURE machinery keeps operating



• For the solution to lubrication difficulties, or chemical feeding problems, more and more companies are turning to Manzel.

...for example:

Chemical Feeders are used throughout the oil industry to keep wells and pipelines in good, flowing condition. *But,* in wet gas fields corrosion frequently stops the motors that power these feeders.

To solve this problem, Manzel developed a chemical feeder with built-in automatic force feed lubrication which protects the gas motor from corrosion and insures continuous operation of the feeder.

For 50 years a leader in the field, Manzel is today a flexible, fast-moving organization with the special technical skill for meeting your needs quickly and economically. Write for further information about Manzel Force Feed Lubricators and Chemical Feeders.

Manzel

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BUFFALO 10, N. Y.

Safeguard high priced machinery with
MANZEL
FORCE FEED LUBRICATION
• Reduce Wear
• Prevent Breakdown
• Slash Oil Consumption
• Insure Round-the-Clock Operation

A DIVISION OF FRONTIER INDUSTRIES, INC.

For more facts circle 591 on Reply Card

NEW PRODUCTS

(Begins on page 132)

Neoprene gasket, is held closed by a latch and captive screws. External mounting feet eliminate the need for leaking mounting holes within the enclosure, company points out. No conduit openings or knockouts are provided, each installation being "tailor-made." The switch and mechanism is company's heavy duty visible blade line with magnetic blowout plates, non-tracking insulation, silver plated copper parts, pressure fuse clips, quick-make-quick-break operating mechanism.

Switches are now in production in 30-, 60-, 100- and 200-amp ratings in either 240 v a-c/250 v d-c and 600 v a-c d-c. Square D Co.

28—POWDER LANCE does difficult piercing jobs

Explaining that powder lancing combines advantages of the powder cutting process with efficiency of oxygen lance operations, the manufacturer of the Oxweld ACL-1 Powder Lance says it automatically mixes the oxygen and powder in correct proportions. Any standard lance pipe, in single or multiple lengths, can be used with it, and its positive pressure powder control is said to give excellent piercing results with multiple lengths up to 63 ft. One lever controls flow of both oxygen and powder, and a thumb latch keeps the valves open as desired, allowing the

operator use of both hands for lance manipulation.

The lance pipe holder works like a drill chuck: a twist of the wrist opens the holder and a reverse twist locks the lance pipe in place. Interchangeable holder sizes are available to fit ¼-, ⅜- and ½-in. pipe.

For use with this lance, the Oxweld D-9 Powder Dispenser is designed to supply a steady flow of the air borne metallic powder through the lance to the reactor zone. It has a 200-lb powder capacity and delivers powder at conveying air pressures up to 100 psi, to enable the lance to be used with multiple lengths coupled together. A relief valve on the dispenser is designed to vent at 100 psi.

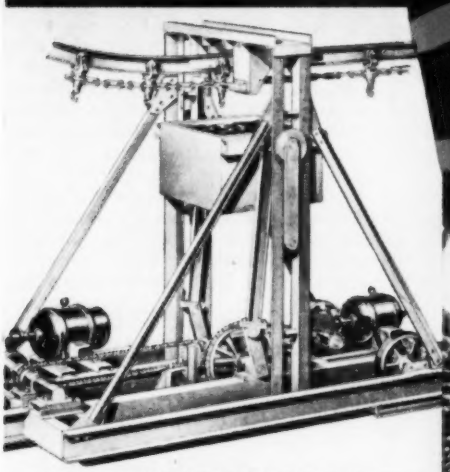
Manufacturer of this equipment suggests its use for piercing holes in many materials that resist the standard oxygen lance. Linde Air Products Co., Div., Union Carbide and Carbon Corp.

29—READY-MIXED FLOORING resists oil and grease

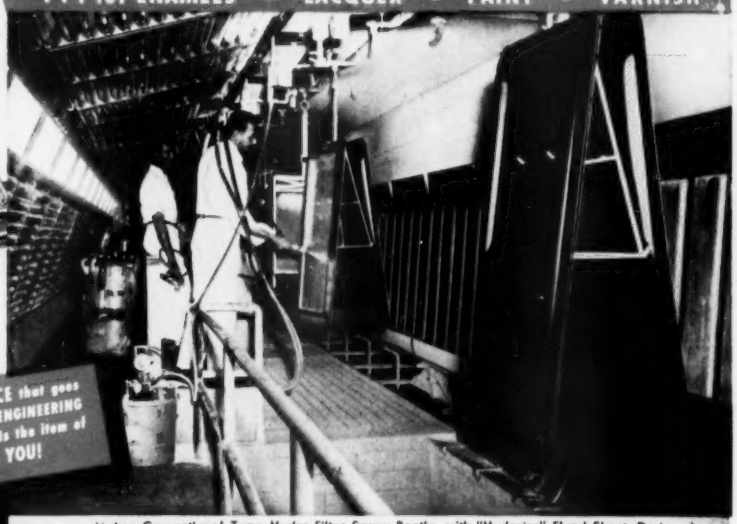
Sylox is described as a type of oxychloride cement that is highly resistant to absorption of oil, grease, fats and solvents of many kinds. No outside

COMPLETE *Finishing* SYSTEMS

. . . for ENAMELS • LACQUER • PAINT • VARNISH



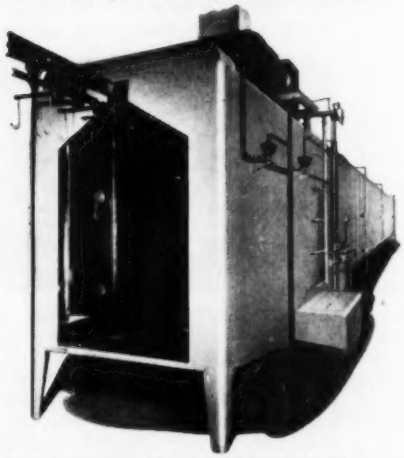
Mahon Automatic Dip-Coating Machine. Paint tank moves up and forward at conveyor speed to immerse parts. It then lowers away and moves back to its original position and repeats. Paint Level and Temperature is maintained by continuous circulation through Flexible Lines.



Mahon Conventional Type Hydro-Filter Spray Booths, with "Hydraire" Flood Sheet, Designed to meet the Specific Requirements of a Home Appliance Manufacturer.

. . . the EXPERIENCE that goes into the PLANNING and ENGINEERING of MAHON EQUIPMENT is the item of GREATEST VALUE to YOU!

Interior View of Typical Mahon Dip-Coating equipment. The Finish Baking Oven is located above this enclosure.



Typical Mahon Flow Coating Machine and Drip Tunnel. Automatic controls and equipment can be provided to maintain constant temperature of coating material.

Should YOUR PRODUCT be SPRAYED, DIPPED or FLOW COATED? or does it demand a COMBINATION of these COATING METHODS?

In some plants, where our advice on finishing methods has been sought, we have found parts being flow coated when substantial savings could have been effected in the over-all finishing costs through the employment of the dip method—savings in thinner, paint, initial cost of equipment and maintenance...and the dip method, in this particular operation would have provided a better finish with fewer rejections. It is therefore wise to get expert advice when confronted with a finishing problem, regardless of what the part or product may be. Many factors enter into the basic and all-important decision on method or combination of methods to be employed to produce the finest results at the lowest possible unit cost. Mahon engineers, with a background history covering thousands of complete finishing systems—including Dip, Flow Coating and Spray Equipment—are in a position to make sound, unbiased recommendations on the "HOW" to finish any product under any conditions or production requirements. Over thirty years of experience in planning, designing, building and installing finishing systems of every type for every conceivable product painted on a production basis, has equipped Mahon engineers with a wealth of technical knowledge and practical know-how not available to you elsewhere . . . can you afford to rely on less when so much is at stake? See Mahon's Insert in Sweet's Plant Engineering File, or write for Catalog A-654.

THE R. C. MAHON COMPANY

HOME OFFICE and PLANT, Detroit 34, Mich. • WESTERN SALES DIVISION, Chicago 4, Ill.

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning, Pickling, and Rust Proofing Equipment, Hydro-Filter Spray Booths, Dip and Flow Coaters, Filtered Air Supply Systems, and Drying and Baking Ovens; Core Ovens, Heat Treating and Quenching Equipment for Aluminum and Magnesium, and other units of Special Production Equipment.

MAHON

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HORTON tanks are better

Every welded tank we build has a Chicago Bridge & Iron Company Field Welding Supervisor assigned to it in addition to the regular Foreman. It is the Supervisor's job to help the Foreman and crew to erect the best tank possible . . . built not only in accordance with, but often above and beyond, the specifications.

The duties of a Field Welding Supervisor are many: he assists in checking all aspects of the welding, supervises the cutting and grading of plugs, helps magnaflux, x-ray and stress-relieve welded joints when called for, and sees that all welding is done in accordance with the governing specifications. He also assists with any tests called for by the specifications, checks welding equipment, and qualifies additional welders if needed and instructs operators in the use of automatic welding equipment. The Field Welding Supervisor is your assurance that you are getting the best tank your money can buy . . . at *no extra cost* to you!

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Chicago 4	2134 McCormick Building	Pittsburgh 19	3243 Alcoa Building
Cleveland 15	2258 Midland Building	San Francisco 4	1582-200 Bush Street
Detroit 26	1569 Lafayette Building	Seattle 1	1370 Henry Building
Houston 2	2166 C & I Life Building	Tulsa 3	1669 Hunt Building

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PA.

NEW PRODUCTS

(Begins on page 132)

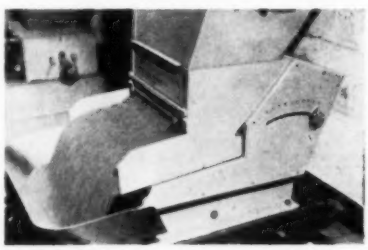
ingredient need be added, not even water. Each "unit" is proportioned and packaged at the factory and is designed to cover a pre-determined area at an average depth of only ½ in. The floors of machine shops, spray booths, kitchens, bakeries and similar areas are suitable for renewing with Sylox, it is noted, and so are areas where a semi-decorative service floor is desirable. It may be applied directly over old surfaces of concrete or wood; comes in several colors. United Laboratories, Inc.

30—VIBRATING FEEDER has highly flexible feed rates

Offering a wide range of outputs, this new vibrating feeder is also announced as compact and inexpensive to operate. According to company, it can turn out from 0.1 to 20 cfm of grain, rock fertilizer or chemical products—for example, it can put out from 300 to 60,000 lb of wheat per hour. Its size is about half that of many similarly rated feeders: 28 in. long, 17 in. wide and 19 in. high. A ⅛ hp motor runs the feeder.

Normal angle of feed is 5 deg downhill; but it will feed 5 deg uphill with some decrease in output. The feeder is claimed to operate quietly, with a working frequency of 1850 vpm and maximum conveying rate of about 50 fpm. The feed rate is controlled by a hand lever, but the machine may also be equipped with electronic controls.

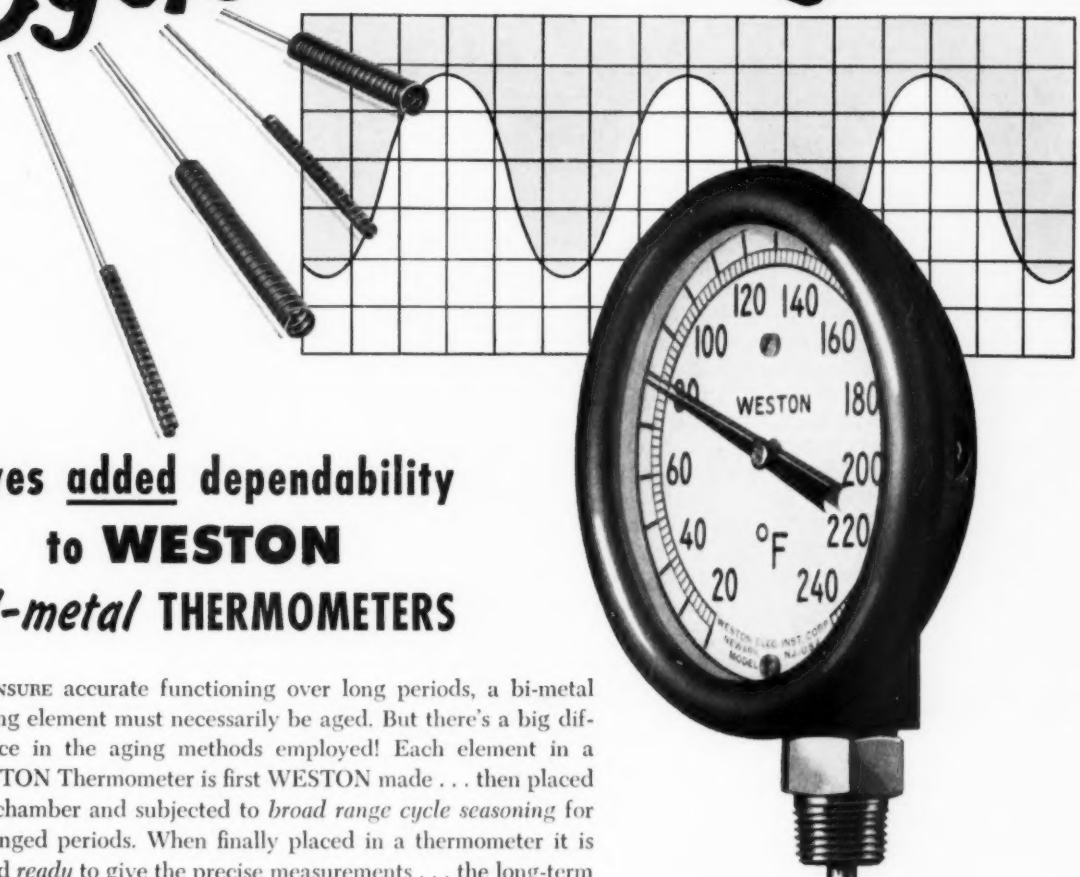
Here's how it works: During processing, feed enters a hopper at the top. Beneath the open bottom of the hopper is a slightly-tilted vibrating tray pivoted on arms equipped with rubber bushings and restrained by opposing



springs. The tray urges material forward beneath an outlet gate and discharges into the processing equipment. The feed tray moves forward at its natural frequency; when it reaches its travel limit, it is suddenly returned by the impact of an anvil pad. This pad, beneath the tray, is part of a separate spring system also vibrating in the direction of the feed and energized by a small rotating eccentric weight. The severity of impact depends on the distance between tray and anvil pad, which is controlled by the hand lever.

Besides the licks it receives from the anvil pad, the feed tray also receives impulses from springs mounted on the

Cycle-Seasoning...



gives added dependability to WESTON *all-metal* THERMOMETERS

To INSURE accurate functioning over long periods, a bi-metal sensing element must necessarily be aged. But there's a big difference in the aging methods employed! Each element in a WESTON Thermometer is first WESTON made . . . then placed in a chamber and subjected to *broad range cycle seasoning* for prolonged periods. When finally placed in a thermometer it is *fit* and *ready* to give the precise measurements . . . the long-term dependability . . . so typical of all instruments bearing the WESTON name. WESTON Thermometers are available in all types, sizes, ranges and stem lengths for all industrial applications. Literature available . . . WESTON Electrical Instrument Corporation, 614 Frelinghuysen Avenue, Newark 5, New Jersey.

Thermometers with the MULTIPLE HELIX

Stocked by leading Distributors

WESTON *Thermometers*

For more facts circle 594 on Reply Card

Here are the reasons why a NORDSTROM *Lubricated* VALVE IS YOUR BEST BUY

When you analyze valves to determine which one is most economical, you can't consider just the initial investment. Such features as these—positive closure . . . quick operation . . . long life . . . resistance to corrosion—must be considered before a valve can be called an economical buy.

How do Nordstrom Lubricant-Sealed valves fare on these requirements? Let's examine them point for point.

With Nordstroms, a positive seal is always assured because lubricant-filled grooves surround seat ports preventing internal and external leakage. Nordstroms operate easily because the plug rotates within the body on a film of lubricant.

Nordstroms last longer because the seating surfaces are protected from corrosion by a film of lubricant that is resistant to the line fluid. Nordstroms are not affected by solids in the line fluid because the seat of the valve is never exposed.

There's a bulletin available describing Nordstrom valves for industrial services. Mail the coupon today for your copy. Rockwell Manufacturing Company, Pittsburgh 8, Pa.

Canadian Licensee:
Peacock Brothers Limited

ROCKWELL Built
NORDSTROM VALVES
Lubricant-Sealed for Positive Shut-Off

Another Rockwell Product

CUTAWAY VIEW OF A NORDSTROM VALVE

Grooves are located in both plug and body to carry pressurized lubricant to all areas of the seating surface. A simple turn of the lubricant screw covers the seating area with a fresh supply of lubricant.

For best results, use *only* genuine Rockwell lubricants in Nordstrom valves.

Dept. No. 5325

Rockwell Manufacturing Company
400 North Lexington Avenue
Pittsburgh 8, Pennsylvania

Please send me a copy of Nordstrom bulletin V-217.

Name _____

Company _____

Address _____
(Street)

_____
(City) (State)

For more facts circle 595 on Reply Card

NEW PRODUCTS

(Begins on page 132)

vibrating anvil attached to the tray. No matter how hard a kick it is receiving, the tray vibrates near resonance, it is pointed out; hence the small power input. Richardson Scale Co.

31—FLUORESCENT FIXTURE for hazardous locations

Announced as explosion-proof and dust tight, the Type EVF Fluorescent Lighting Fixture is designed for use where explosive gases, vapors, or combustible dusts necessitate safe lighting. These fixtures may be spaced end-to-end for continuous and uniform illumination along work areas.

Each fluorescent tube is housed in a tube of heat-resisting glass. The tube ends are reversed tapered and sealed into cast aluminum housings which also contain the lamp receptacles. Recep-

tacle housings at the ballast ends are pivotally connected to the ballast housing. At the relamping ends, the receptacle housings are fastened to a supporting stem assembly attached to the ceiling or a structural member.

The reflectors are sheet metal. Attached by spring clips they may be inserted or removed after the fixture is hung. For end-to-end placement of the fixture on close centers, a link member of the supporting stem assembly allows the relamping end of the fixture to be lowered several inches for access without interference by adjacent fixture. The Type EVF is available for straight pendant mounting, but special fittings for 45-deg mounting may be obtained. Crouse-Hinds Co.

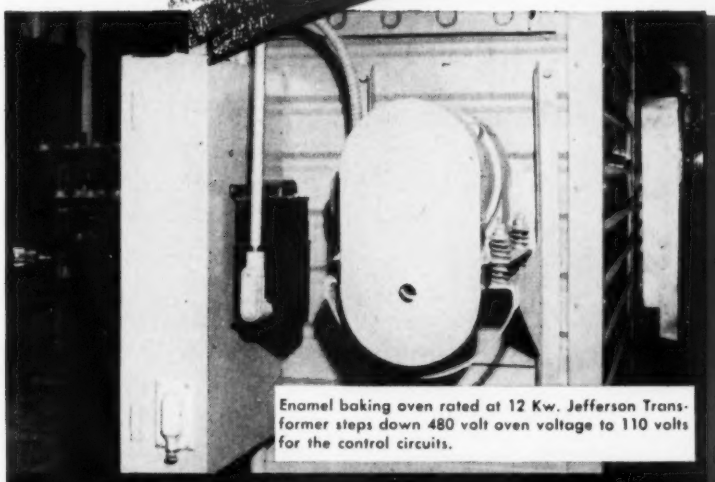
32—DUST-FUME ELIMINATORS, vertical rotor, wet type

Of these two new Centri-Merge Vertical Rotor Dust and Fume Eliminators, one is designed for wet collection and elimination only, while the other is combination primary dry and secondary wet collection unit. The latter has a built-in dry type pre-cleaner for dry collection of heavier and most fine particles, and is said to be particularly useful where material salvage is an operational requirement.

Both units combine the cyclonic principle of dust separation and positive high pressure water action to remove impurities from the air in a rotating torrent of water. For certain applications, company engineers say that liquids other than water may be used. Capacities run from 500 to 50,000 cfm.

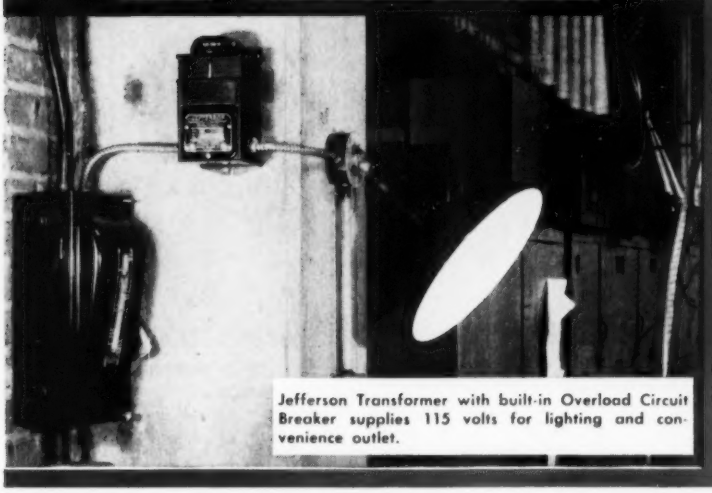
Among advantages claimed for the new equipment are low ratio of power to rated capacity, high ratio of water

Step Down High Voltage with Dry Type Jefferson Transformers

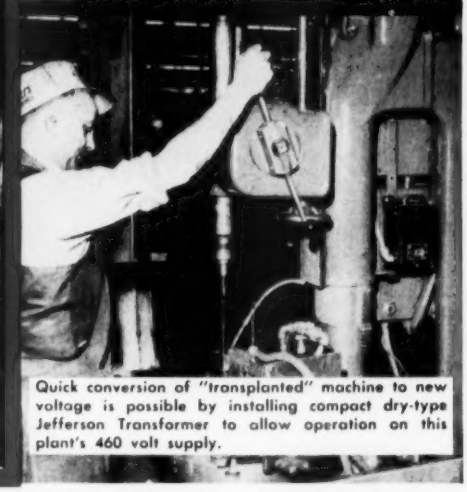


Enamel baking oven rated at 12 Kw. Jefferson Transformer steps down 480 volt oven voltage to 110 volts for the control circuits.

Jefferson Power Circuit Transformer mounted directly on machine stepping down 460 volts to 115 volts for control circuit and machine lights. Note Overload Circuit Breaker with Reset Button.



Jefferson Transformer with built-in Overload Circuit Breaker supplies 115 volts for lighting and convenience outlet.



Quick conversion of "transplanted" machine to new voltage is possible by installing compact dry-type Jefferson Transformer to allow operation on this plant's 460 volt supply.

SUPPLY LOW VOLTAGE WHERE YOU WANT IT—ECONOMICALLY!

Jefferson Power Circuit Transformers installed at the point where low voltage (115-230V) is required eliminate long secondary feeders, save copper, conduit and maintenance. You improve voltage regulation, eliminate secondary voltage drop. Save money by taking advantage of the economies and efficiencies of modern high voltage power distribution.

Installing Jefferson Transformers is fast and easy. Sturdy mounting brackets, roomy wiring compartment and ½" and ¾" knockouts are provided. The small compact design permits mounting directly on, or near machinery or other point of low voltage use. Relocating is as easy as moving a switch.

Stock Sizes: 50 V.A. to 15,000 V.A. — 460/230 V. Pri. — 230/115V. Sec. — 575 V. Pri. — 230/115V. Sec. Listed by Underwriters' Laboratories, Inc.

JEFFERSON ELECTRIC COMPANY
Bellwood, Illinois

Jefferson Transformers

SOLD THROUGH LEADING WHOLESALERS

For more facts circle 596 on Reply Card

Ready for you after 12 months of brutal

CUSTOMER TESTING!

CLARK's

New and Exclusive

HYDRATORK DRIVE*

Here's how it improves your fork-truck operation:

1. **MORE WORK:** faster get-away, positive power without slippage; moves heavy loads and climbs ramps with ease.
2. **LOWER COST:** higher percentage of "on-the-job" time results from no clutch problems, "cushioning" effect on motor and drive members.
3. **GREATER SAFETY:** hydraulic brake system, linked to torque converter, automatically cuts power; engine cannot be started unless controls are in neutral.
4. **IMPROVES DRIVER EFFICIENCY:** finger-tip direction control and elimination of gear-shifting conserves operator energy.

Not one, but *eighteen* HYDRATORK-equipped trucks were placed in customers' plants for a full year of on-the-job testing. Without exception, these units proved that reduction in driver fatigue and of truck downtime results in greater production from HYDRATORK-equipped trucks.

1903 1953 FIFTY YEARS CLARK EQUIPMENT

* *Now available in 6-7000 lb. capacity truck*

Mail the coupon for detailed literature which explains how CLARK's new and exclusive HYDRATORK DRIVE operates.

CLARK ELECTRIC, GAS, DIESEL, L.P. GAS **FORK TRUCKS**
AND POWERED HAND TRUCKS - INDUSTRIAL TOWING TRACTORS

INDUSTRIAL TRUCK DIVISION • CLARK EQUIPMENT COMPANY • BATTLE CREEK 98, MICHIGAN
Please send: ☐ Hydratork literature ☐ Condensed catalog
☐ Have representative call

Name_____
Firm Name_____
Street_____
City_____ Zone_____ State_____

AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

For more facts circle 597 on Reply Card

NEW PRODUCTS

(Begins on page 132)

circulated to air volume handled, and an independently driver rotor and fan to permit adjustments to meet load and operating conditions. The units are available with integrally constructed fan, or they may be arranged for standard fan installation. Disposal of material collected in the tank is by drag conveyor, hopper tank skim-off, or manual clean-out. After cleaning, excess moisture is removed from the air by extractors. Schmieg Industries, Inc.

33—MICROFILM CAMERA can photograph stapled sheets

Single pages or series of pages stapled together can be microfilmed without removing the staple through the use of the Film-A-Record Model 4, according to manufacturer. The new microfilm camera is designed to handle even bound volumes with the pages spread open, magazines, engineering notebooks and other bulky originals in sizes up to 11-by-17 in.

A visual supply indicator shows how much film is left in the camera, while an audible signal warns the operator when the film has been loaded improperly, when the take-up reel is full, or when the film fails to advance properly. The film loading is described as simple, and a foot switch is provided for controlling the operation of photographing the document and advancing the correct amount of film. A colorstat permits increasing or decreasing light intensity for photographing documents of varying color. The machine can be operated at speeds to 1500 exposures an hour. Remington Rand Inc.

34—PUMP MOTOR holds pump on its mounting bracket

Designed specifically for use with centrifugal pumps and available as high as 60 hp is the new Type SCB Close-Coupled Pump Motor. It eliminates shaft alignment or pump mounting problems by supporting the pump on its NEMA Style C registered mounting bracket, says manufacturer. A step shaft, with special diameter, shoulder and tapped hole for mounting the impeller, has ground diameters for precision assembly, sealing against leakage.

Grease lubricated ball bearings permit vertical, horizontal or intermediate angle installation, and a solid, closed flange on the adapter bracket serves to keep pumped liquid out of the motor. And, as further protection, a bronze slinger is mounted on the take-off shaft for deflection of any packing leakage. U. S. Electrical Motors, Inc.

35—DIAMOND WHEEL does fast cutting on carbide

When used with a coolant, the Jetaline Diamond Wheel will plunge cut in a single pass a $\frac{1}{8}$-in. slot in a carbide blank 1 in. long, according to manu-

"This new packaging plan for Westinghouse Breakers sure makes my job easier"

"It saves buying time. I can get immediate delivery of enclosed circuit breakers. And it speeds installation—eliminates taking the breaker out of the enclosure in order to mount the enclosure, run conduit and pull in cable."

Westinghouse is now packaging enclosures and breakers separately. This enables Westinghouse Distributors to offer you a complete line of AB-I Circuit Breakers—to meet any application by merely matching the right breaker frame and rating with the right NEMA enclosure. Separate packaging adds flexibility—prevents damage to AB-I's at the job site before installation—makes the whole job easier.

Now, more than ever, your best protection buy is AB-I. For rugged, reliable Westinghouse AB-I Circuit Breakers are tops in both performance and convenience. For more facts, see your Westinghouse Distributor or write for B-5456, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-30171

YOU CAN BE **SURE**...IF IT'S

Westinghouse

APPARATUS DISTRIBUTOR

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Buy Guaranteed Efficiency in your Dust Collection... Consult Norblo

Guaranteed efficiency of fume and dust collection systems engineered and built by Norblo is obtainable because Norblo Equipment includes automatic bag type, improved centrifugal, and hydraulic types. Your operations may require one of these types — or all three! Norblo can tell you — will engineer the necessary combination to handle your dust and fume collection at most economical cost. More than 40 years experience serving many industries. State your problem so we can send literature on equipment applicable to your needs.

Norblo *Portable* Dust Collecting Units solve many localized problems.

Ask for Bulletin 163-5

The Northern Blower Company

Engineered Dust Collection Systems for All Industries

6423 Barberton Ave. OLympic 1-1300 Cleveland 3, Ohio

For more facts circle 599 on Reply Card

NEW PRODUCTS

(Begins on page 132)

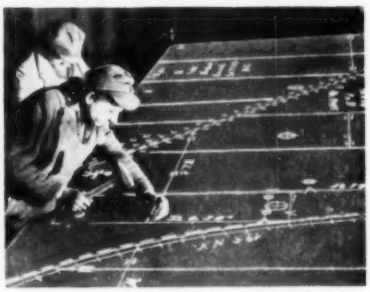
facturer. Other carbide grinding operations are claimed equally fast. This unusual cutting action is attributed to the use of a special alloy metal bond which is non-glazing and non-loading —and thus avoids overheating and the need for diamond wheel redressing.

Company says that fine diamond meshes, ineffective with many types of wheels, can be used for micron finishing. And because the Jetaline Wheel is non-glazing, the exact finish for any specified diamond mesh is easily obtained. Experiments are reported to show that this wheel has a longer life than many wheels in common use—will last seven times as long as some. Action Diamond Tool Co.

36—OPTICAL MARKING SYSTEM simplifies lofting

Developed in Germany for the shipbuilding industry, the Lumotrace System is now available for distribution in this country. This system permits optical projection of scale drawings directly and in full size on the material to be fabricated, eliminating the need for a full scale layout of the ship's lines on the loft floor. Because lofting is of special importance in shipbuilding, the use of this system has been confined to that industry to date. Aircraft industries here have used a somewhat similar system, but because of the relatively smaller size of materials used, the optical problems were not the same.

Basically the new system is this: Draftsmen prepare standard body frames, sections and lines plans to 1/10th scale. From this they develop the hull plating dimension drawings to the same scale. These drawings are photographed on glass negatives, which are placed in a projector and beamed directly on steel plates. Unskilled workmen then trace this image in the plate.



A high precision camera and optical projector are used. The camera is mounted on a vertical track and pointed downward to a glass topped table on which the drawings to be photographed are placed. The projector is mounted 30 ft above a special work table. A lens of relatively short focal length enlarges the negative 100 times in lineal dimension, or 10,000 times in area, and projects the image directly on the work surface. Marking of the plate is done

NOW! Tuffy-Twins Team Up

TO CUT CRANE HOISTING COSTS!

A NEW **Tuffy** HOIST LINE

As Tough as Tuffy Slings

Throughout industry where slings are used, Tuffy Slings have set high performance records. Their extra flexible, non-kinking, non-knotting, patented 9-part braided construction has in a few years made Tuffy the sling preferred by the men who work with them and the men who watch sling costs.

Many times our engineers have been propositioned to develop a hoist line which would measure up to Tuffy Slings in flexibility, wearability and extra toughness to absorb load shocks and stay on the job longer, and cut downtime and hoist line costs.

Now, you can forget about all the complicated specifications you've wrestled with in buying hoist lines. Just give the diameter and length wanted and specify Tuffy Hoist line.

After many months of laboratory research and many more months of testing in field, Union engineers are ready to put the *New Tuffy Hoist Line* up against any rope ever used on overhead, stiff leg and mobile cranes. Reports from the field tell of Tuffy Hoist Lines running two and three times as long as the ropes previously used. Next time reeve your crane with Tuffy.

Write for 48 page Sling Hand Book and Rigger's Manual and information on Tuffy Hoist Line.

Forget Specifications...
Say Tuffy To Your Distributor...

and tell him the diameter and length. To order slings, specify Tuffy, sling type, diameter, length and fittings wanted. Or you can buy Tuffy braided wire fabric on the reel if you do your own rigging.

Your distributor can supply the Tuffy you need.

union Wire Rope **corporation**

2272 Manchester Avenue • Kansas City 26, Mo.

Specialists in High Carbon Wire, Wire Rope, and Braided Wire Fabrics

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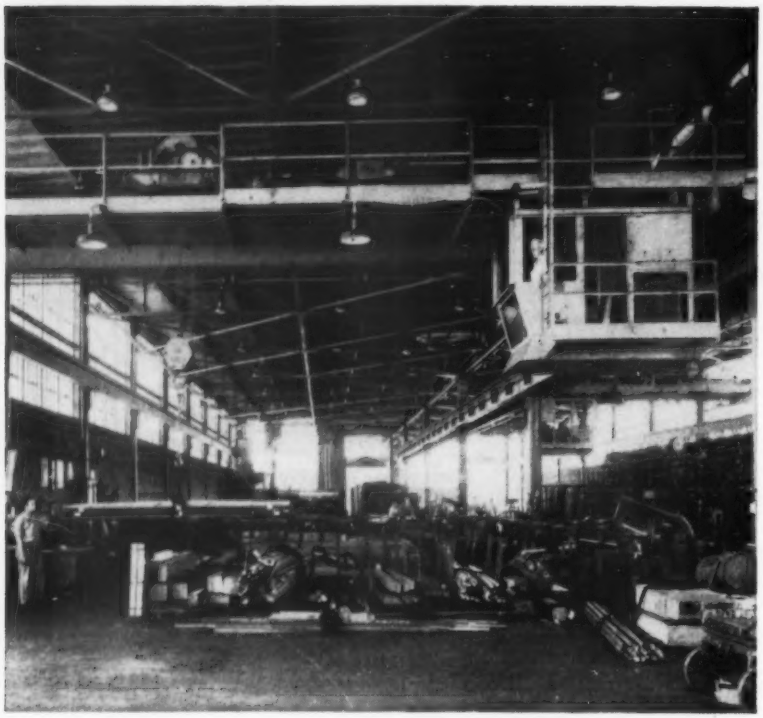
SHEPARD NILES CRANE

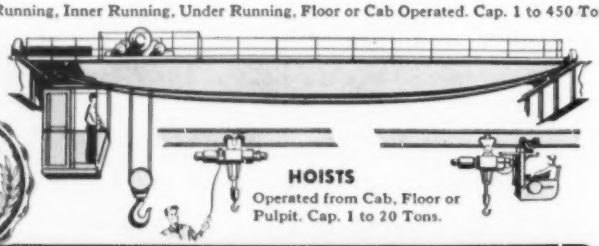


FREES FLOOR SPACE for production & storage

Why waste space that's suitable for production or storage on floor-level systems of handling! Let a Shepard Niles Crane put unused ceilings to work—you'll speed production, eliminate re-handling, move heaviest loads safely, at low cost.

Thrifty through-the-air handling can make more space in your plant. But be sure you choose the right crane! Ask the Shepard Niles representative to show you data on installations similar to yours—help you select the correct equipment. Write today for Bulletin describing Shepard Niles Cranes—and arrange to have a representative call.

CRANES
Overhead: Top Running, Inner Running, Under Running, Floor or Cab Operated. Cap. 1 to 450 Tons.



50th ANNIVERSARY
SHEPARD NILES CRANE & HOIST CORP.
1903-1953

HOISTS
Operated from Cab, Floor or Pulpit. Cap. 1 to 20 Tons.

SHEPARD NILES
CRANE AND HOIST CORPORATION

2231 SCHUYLER AVENUE, MONTOUR FALLS, N.Y.

For more facts circle 601 on Reply Card

NEW PRODUCTS

(Begins on page 132)

with a hammer and center punch; written instructions are painted on.

Besides reducing the amount of drafting required, and eliminating many large templates and their storage problems, this system is reported to offer shipbuilders significant savings in material, fewer reworks and rejects, and improved production scheduling. American distributors of the Lumotrace System believe it can be applied profitably to other industries with large lofting problems. Ampower Corp.

37—REVOLVING HEAD for use on electric rider trucks

This attachment is now available on manufacturer's narrow-aisle rider-type electric trucks. It is designed to handle rollover boxes containing small parts for machine feeding. It permits machines to be fed in this manner by rider trucks operating from narrow aisles and congested areas. One truck can pick up the loaded box in the storage area and carry it directly to the machine. The same attachment can also be used for stacking and storage of pallets in warehousing operations or skid loads or work-in-process in manufacturing areas. The Raymond Corp.

One of these products may be "just what you're looking for." Use the handy Reader Service Cards to ask for more information on it.

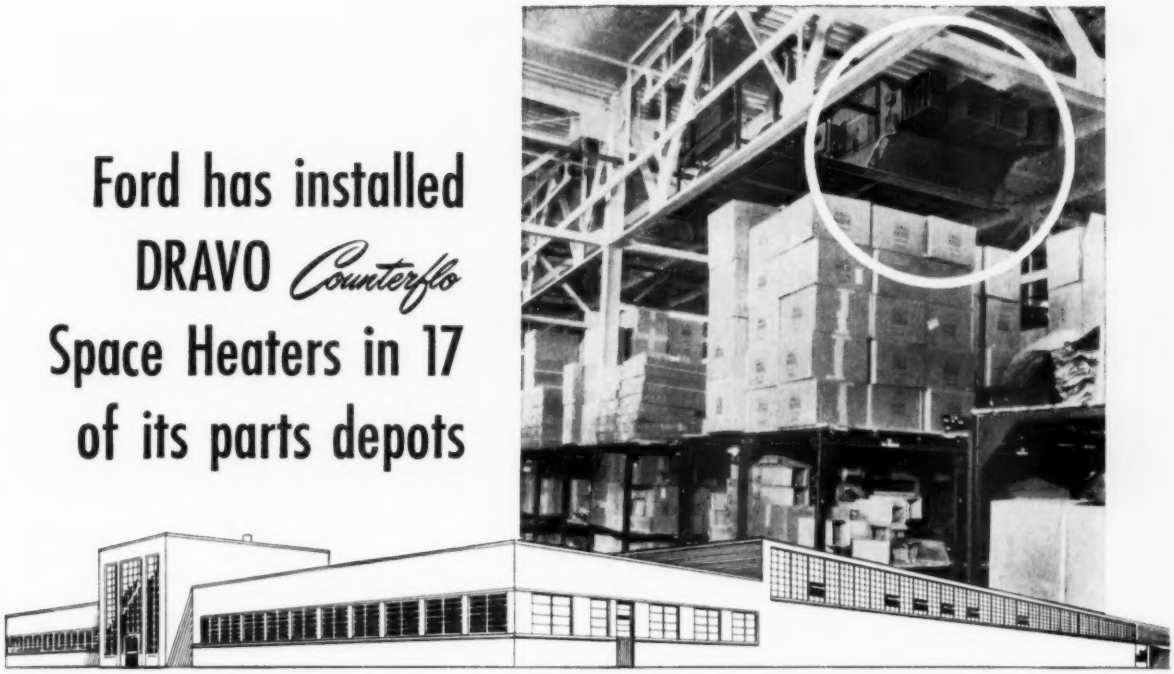
38—INSTRUMENT for inspection of interior surfaces

The Inspecto-Scope is a five-power optical instrument designed for surface examination and inspection of hidden or recessed surfaces or similar concealed or partially concealed areas where direct, close visual inspection would be difficult or inadequate. It is suggested for inspecting such hard-to-reach areas as between walls, back of dividers and inside tubular and cylindrical walls.

Constructed of metal, except for the plastic eye-cap, the Inspecto-Scope consists of two main parts: the eyepiece, housing the optical system; and the En-tube, equipped with midget bulb, bulb protector, mirror and cover, light switch, battery cable and poles.

In operation, the surface to be inspected is illuminated by the lighted bulb. The image is picked up by the mirror and reflected back to the eyepiece where it is magnified five times. The En-tube revolves 360 deg to allow viewer to inspect all surfaces of an object without changing the position of the eyepiece. The Inspecto-Scope is 17 in. long, weighs 1¼ lb and costs about $75.00. Badger Sales Co., Inc.

Ford has installed DRAVO *Counterflo* Space Heaters in 17 of its parts depots



In planning the heating system for 17 of its parts depots in various parts of the country, Ford Motor Company wanted to:

1. Keep floor areas free for maximum storage
2. Heat large warehouse areas
3. Provide uniform heat throughout the area

Typical of the Dravo *Counterflo* Space Heaters installed by Ford is the one illustrated at its Cleveland Parts Depot. Dravo Heaters provide:

ADAPTABILITY—Dravo Heaters are mounted horizontally on overhead girders, 16 ft. above the floor, saving valuable storage space and allowing maximum use of the floor area.

PENETRATION—Dravo Heaters' high-capacity fans re-circulate the air completely throughout the 140,560 sq. ft. area in 25 minutes, despite the tiering of material in uneven heights. Directional louvres guide the flow of air. The area can be warmed quickly in winter and cooled easily in summer.

ECONOMY—Dravo Heaters are thermostatically controlled to keep temperatures constant. Installation cost was kept to a minimum, because no ductwork was required. Minimum efficiency is 80%. Roof heat losses are low.

These and many other advantages can be yours when you install Dravo *Counterflo* Space Heaters in your commercial or industrial building. Write for complete details. Use the coupon.

DRAVO
CORPORATION

PITTSBURGH • ATLANTA • BOSTON • CHICAGO • CINCINNATI
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Dravo Corporation, Heating Department
Dravo Building, Fifth and Liberty Avenues
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Send me information about heating for the subjects I've checked, and Dravo Heater Catalog QR 52 -2435.

- ☐ Space heating industrial buildings, warehouses, garages, hangars.
- ☐ Stores, schools and auditoriums.
- ☐ Process drying and heat curing.
- ☐ Tempering make-up air.
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- ☐ For use in conjunction with air conditioning.
- ☐ Please have a representative call at no obligation to me.

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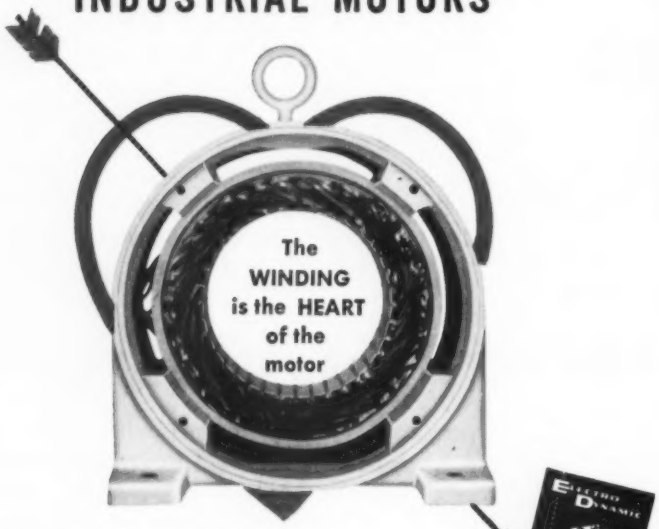
ELECTRO *xtra* DYNAMIC *ependable*

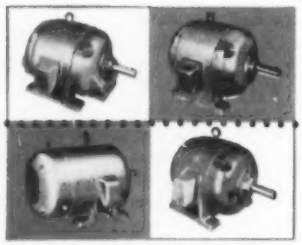
INDUSTRIAL MOTORS



Every Electro Dynamic motor is built with
EXTRA INSULATION in stator slots and between phases
EXTRA IMPREGNATIONS and bakings of the wound stator
EXTRA HIGH-FREQUENCY TESTING of insulation between turns

WRITE TODAY FOR CATALOGUE NO. 1070

From 1 to 250 Horsepower (N. E. M. A. STANDARDS)



One-piece cast iron frames.

Extra large "free-flo" air channels.

Permanently aligned cast iron brackets.

Liberal size grease lubricated bearings.

Also a complete line of Direct Current motors and generators

ELECTRO DYNAMIC
DIVISION OF GENERAL DYNAMICS CORPORATION
BAYONNE, NEW JERSEY

For more facts circle 603 on Reply Card

Static Conducting V-Belts

(Continued from page 83)

needs to be made to act as a conductor for the static electricity. This construction contributes to longer belt life since too much or too many pigments decreases the quality of a rubber compound.

To determine the conductivity of a static belt a section of it is tested for the amount of resistance to an electric current between two contact points. In general, the less the resistance, the greater is its conductivity.

Before a standard method of testing was adopted, there was some difference of opinion as to how conductive a static conducting belt should be in order to eliminate any possibility of building up a dangerous static charge.

One manufacturer of static belts, after a number of tests conducted under low humidity conditions—9 per cent to 33 per cent—found that no measurable static voltage was built up in belts having a resistance as high as 100 megohms over a four-inch length of belt.

A source outside the rubber industry, checking on the safe handling of gasoline, determined that no sparks can occur between two metal contacts no matter how short the gap, unless a potential of approximately 300 v exists across the gap.

After many tests and experiments the Rubber Manufacturer's Association set up the following standard which today governs the manufacture and sale of static V-belts:

"The RMA standard method of measuring conductivity of endless V-belts shall consist of two $\frac{5}{8}$-in. diameter flat contacts, $8\frac{1}{2}$ in. on centers, moistened with water and pressed against the belt with 25-lb pressure total for the two contacts. The conductivity shall be measured on a 500 v megger unit. Belts having a resistivity of six megohms or less on the new belt, measured by the above method, can be classified as static conducting."

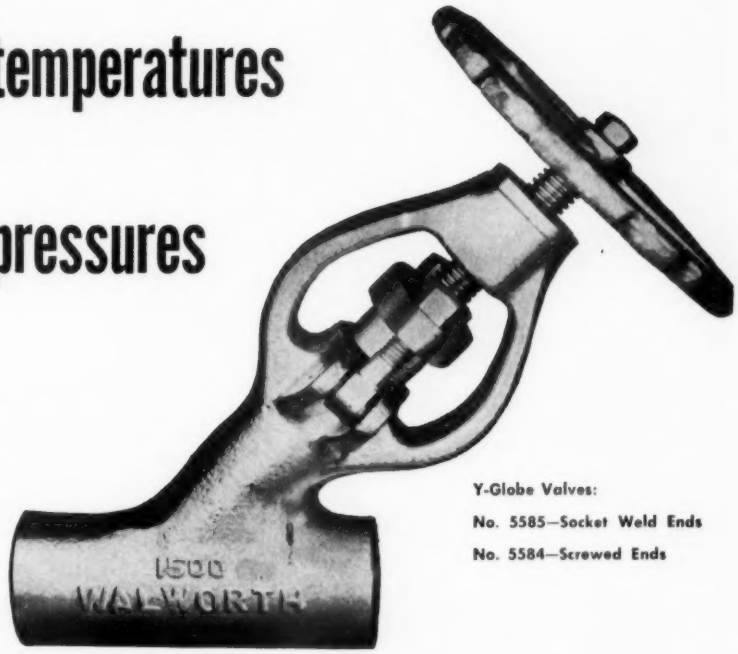
Most static belts are fully checked for static conducting properties just before shipment from the factory. Since test and experience show no evidence of static build-up in V-belts having an allowable resistance when new of six megohms or less over an $8\frac{1}{2}$-in. length, it can safely be assumed that such protection is more than adequate.

One of the most important facts to remember is that unless metal sheaves are used and the motor and driven machine are *adequately grounded*, no matter what static belt is used there will be no protection against sparking. Further, the drive must be protected at all times. Dirt, oil or water, coming in contact with them may change the characteristics of static belts.

Walworth's NEW small cast steel valves

SERIES 1500 – SIZES ¼ to 2 inches

handle HIGH temperatures
HIGH pressures



Y-Globe Valves:
No. 5585—Socket Weld Ends
No. 5584—Screwed Ends

Walworth is proud to make these new Small Cast Steel Valves available to power stations . . . oil refineries . . . ships . . . wherever piping is subject to severe pressures and temperatures. Non-shock service ratings of these valves: 1500 psi–950F for steam; 3600 psi–100F for water, oil or gas. Cast of chromium molybdenum steel, they are compact and light, yet exceptionally strong. Both Y-Globe and Angle type valves are available.

Angle Valves:
No. 5587—
Socket Weld End
No. 5586—
Screwed End

Simplified Walworth design eliminates many of the valve problems encountered in high pressure service. Among the features of this new valve are:

INTEGRAL BODY AND YOKE – made from a single casting without threading or welding. Bonnet joint — always a potential source of leakage — is eliminated. Valves can be reassembled quickly and easily.

ROTATING DISC – prevents valve seat distortion and consequent leakage. Cuts down replacements.

WELDED SEAT RING – compensates for changes in pressure and temperature—eliminates a major source of leakage.

SPECIAL BACK SEAT BUSHING – permits repacking the valve under pressure with greater safety.

PACKING CHAMBER – designed to dissipate heat thus keeping packing rings at lower temperatures—gives them longer life.

These valves are available with either socket weld ends or screwed ends, in sizes ranging from ¼ to 2 inches. For further information on Walworth series 1500 Small Cast Steel Valves, see your local Walworth distributor, or write for Circular No. 134.

WALWORTH

valves • fittings • pipe wrenches

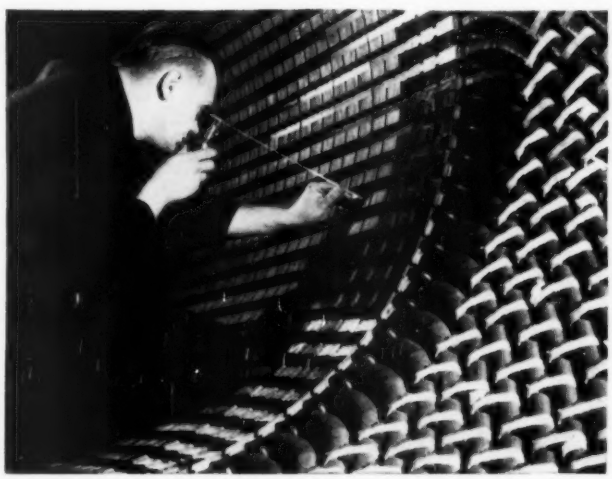
60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

For more facts circle 604 on Reply Card

Genuine Westinghouse Renewal Parts Warehouses in your area enable you to keep low parts inventories on hand. With our fast and efficient ordering system you need to keep on hand only those parts most frequently needed for fast repairs.

Modern Westinghouse Repair Plants like this one are located close to you. These plants are well-equipped, ready to repair your Westinghouse apparatus at a moment's notice. This service by Westinghouse craftsmen cuts your repair time and costs.



Apparatus repairs require highly skilled craftsmen. These Westinghouse engineers working out of our Field Offices can give you top-quality, on-the-job repairs. Westinghouse engineers are trained to catch trouble before it starts.

How Westinghouse maintenance reduces inventories . . . cuts repair time and costs

Westinghouse offers you a well-planned and compact maintenance service that gives you complete service protection for your electrical apparatus.

1. Genuine Westinghouse Renewal Parts are designed specifically for Westinghouse apparatus. These parts embody the latest engineering advances that give you a better part—often better than the one designed for the original equipment. Westinghouse parts are precision built on the same machines that turn out parts for new apparatus designs. This assures you that the new part you are replacing is *no* imitation that wears out quickly—but a part that has exactly the tolerance, size, and quality you need for dependable operation.

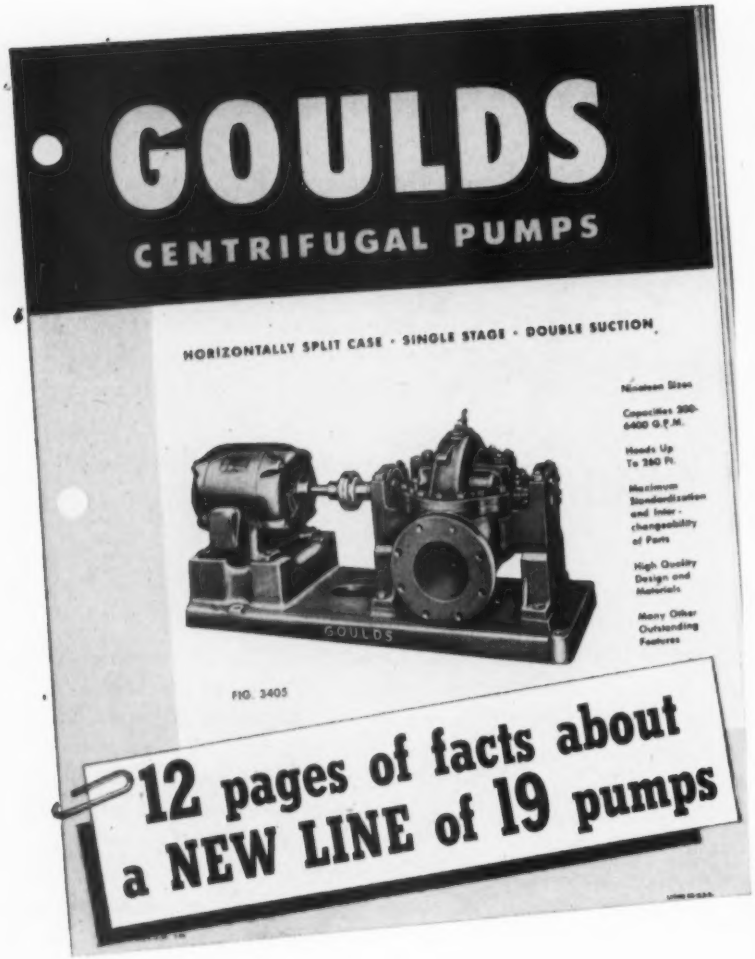
Strategically located Westinghouse Renewal Parts Warehouses enable you to keep your parts inventories *low* . . . eliminates the need for overstocking. This gives you definite savings in cost, time, and stocking space.

2. 36 Repair Shops throughout the country give you substantial savings by repairing your Westinghouse equipment right the first time. Your apparatus is repaired in these shops with Genuine Renewal Parts with the same craftsmanship that goes into modern Westinghouse apparatus. Why not avail yourself of these facilities and "know-how."

3. When your equipment cannot be moved, on-the-spot repairs can be made in your own plant through our field service facilities. Experienced apparatus engineers, working out of these offices, can save you time and money, because they have been expertly trained to inspect and repair Westinghouse equipment. By utilizing this field service you will catch potential trouble early, thus, protecting your production output and eliminating costly repair bills. Westinghouse Electric Corporation, Maintenance Sales Dept., East Pittsburgh, Pennsylvania. J-95164

YOU CAN BE **SURE**...IF IT'S
Westinghouse

For more facts circle 605 on Reply Card


GOULDS
CENTRIFUGAL PUMPS
HORIZONTALLY SPLIT CASE · SINGLE STAGE · DOUBLE SUCTION
Nineteen Sizes
Capacities 200-6400 G.P.M.
Heads Up To 260 Ft.
Maximum Standardization and Interchangeability of Parts
High Quality Design and Materials
Many Other Outstanding Features
GOULDS
FIG. 3405
12 pages of facts about a NEW LINE of 19 pumps

The quickest way you can really discover what the new Goulds Fig. 3405 centrifugal pump can do for you is to read the descriptive bulletin pictured above.

Here are some hints of what you'll find:

The quality of materials and extras of design that you have been able to get only by paying extra are *standard* on this new pump: stuffing box bushings, stainless steel impeller keys, Teflon water seal rings —to mention a few.

The Fig. 3405 carries interchangeability of parts far beyond anything we've been able to do before. Only three shaft and rotating parts assemblies (exclusive of impellers and wearing rings) provide for 19 pump sizes.

This means real spare parts inventory savings for any plant that uses many pumps. It also means easy-to-make field changes to meet new requirements.

We've come as close as modern design and materials allow to putting into this new pump what our industrial customers have told us they want. The 12-page illustrated bulletin tells you all about it. We'll be glad to send you a copy.

To get a copy of Bulletin 721.6, get in touch with the nearest Goulds representative or just fill in the coupon, pin it to your letterhead and mail it to us at your convenience.

GOULDS PUMPS, INC.
Dept. PL, Seneca Falls, N. Y.
Please send me 12-page information Bulletin No. 721.6 on the new Fig. 3405 centrifugal pump.
Name_____
Company_____
Street_____
City_____ Zone____ State_____

Goulds PUMPS INC. Seneca Falls, New York

For more facts circle 606 on Reply Card

Space Utilization

(Continued from page 110)

move the cells through the closed, pressure-ventilated spray booth and the drying and sanding areas.

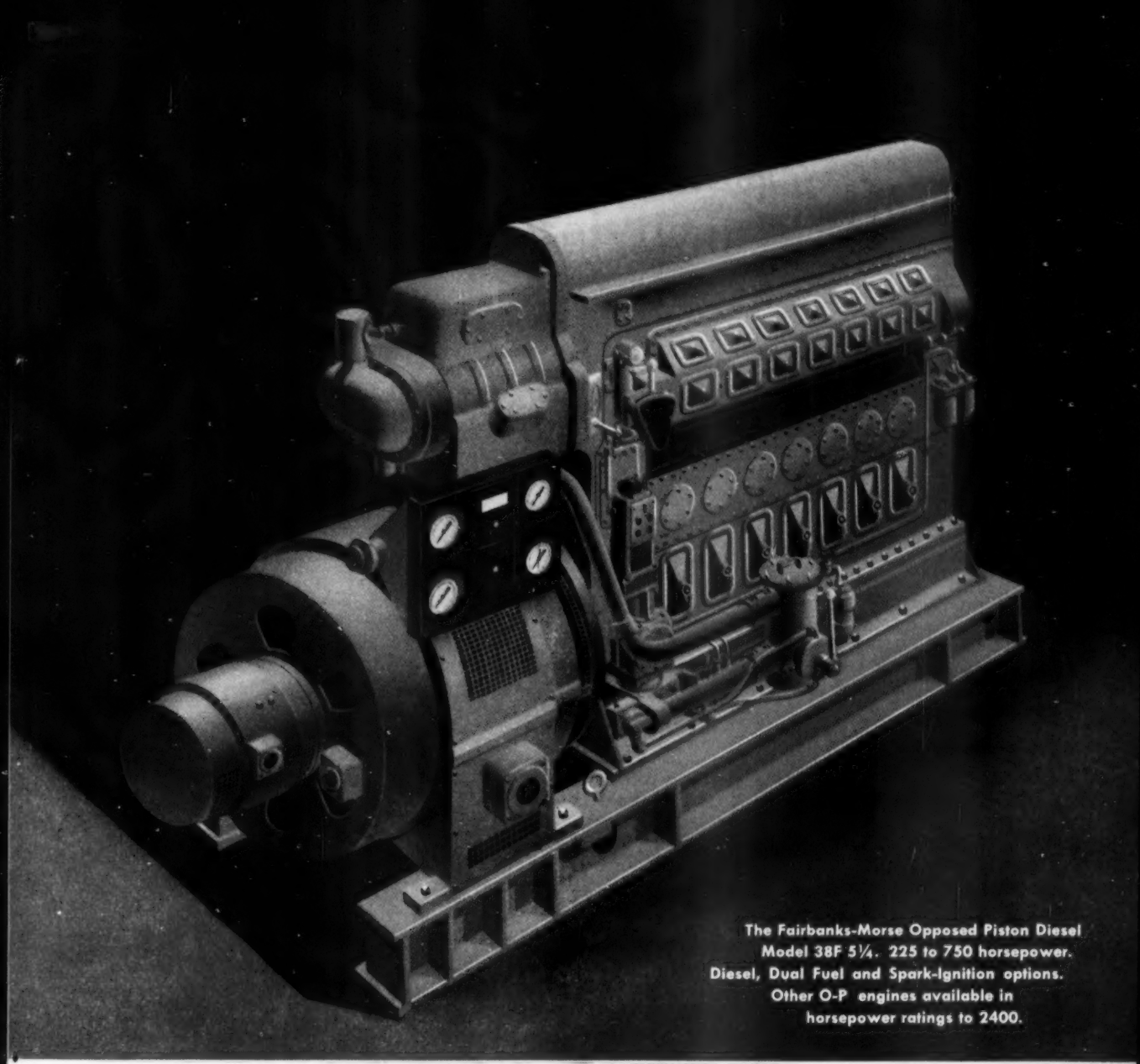
This method makes all surfaces of the big tanks accessible for processing and provides a satisfactory way to move them down the line with little effort. Also, since the tanks are bulky and require extended time for drying, this innovation serves a dual purpose as a temporary storage facility with handling kept to the minimum.

To meet the stepped up demands of the Pratt and Whitney Aircraft exhaust systems project, required a somewhat different approach. Each exhaust system for the Wasp Major engine is composed of seven big, stainless steel sections which are slightly different in design but similar in appearance. They are too big to be picked up and handled easily or placed upon a belt conveyor. A basic problem was the difficulty in differentiating between the similar sections and maintaining a balance of production so that complete engine sets would come off the production lines for shipment.

By use of a tailored layout, Ryan has increased the volume of this work, improved employee morale, enhanced parts quality and saved 50 per cent of the space otherwise required. The layout was broken into four contiguous areas and each was circled with floor tracks and served with mobile parts dollies. Special racks were located at strategic points and both racks and dollies were keyed to the various production machines. The racks automatically count the parts produced and give visual evidence of out-of-balance conditions. Space is saved by bringing all machines together within the areas and using the dollies to convey parts. Added space is conserved by suspending the spot welding machines overhead and placing the heavy alignment fixtures on wheels and tracks also. These converge into central turntables so that they can be rotated under the spot welders, to make all parts of the fixtures available.

Employee morale is stimulated because the well-defined flow lines of the system prevent similar parts from being mis-routed. Workmanship is enhanced because any error shows up at the subsequent station when the part is checked. A unique method of using roving crews, who perform one task at each of the seven fixtures in a production area, has increased employee skill by contributing to greater specialization of labor.

Tracks and mobile fixtures have been used to excellent advantage in the fabrication of the Ryan external fuel tanks. It takes four men to lift the sections of these tanks and more than 30,000 spot welds are used to



The Fairbanks-Morse Opposed Piston Diesel
Model 38F 5¼. 225 to 750 horsepower.
Diesel, Dual Fuel and Spark-Ignition options.
Other O-P engines available in
horsepower ratings to 2400.

. . . always a need for something *Finer*

It was designed and built without thought of price . . . built only to give the maximum of heavy-duty horsepower in a minimum of space . . . plus an unvarying reliability upon which you could stake a balance sheet of operating costs and profits.

The price?

Not quite as low as conventionally designed and conventionally manufactured engines, but low enough to insure that no one who wants and needs an engine which gives more, need forego its ownership. For the more difficult tasks of producing power, this engine is a fulfilling answer.

Fairbanks, Morse & Co., Chicago 5, Illinois.

FAIRBANKS-MORSE
a name worth remembering when you want the best

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • RAIL CARS • ELECTRICAL MACHINERY • PUMPS • SCALES • HOME WATER SERVICE EQUIPMENT • FARM MACHINERY • MAGNETOS

For more facts circle 607 on Reply Card

NEW! "Buffalo" TYPE "BL" Limit-Load REG. U.S. PAT. OFF. Ventilating Fan

In our seventy-six years of fan manufacturing, no fan has been more respected for fine performance than the "Buffalo" Type "LL" Ventilating Fan. This fine performance is now further improved in the new "Buffalo" Type "BL" Limit-Load Fan — designed especially for general ventilation, air conditioning and industrial service.

This new fan offers: (1) High efficiency; (2) Minimum noise level, over wide capacity range; (3) Full Limit-Load horsepower characteristic; (4) Stable performance from shut-off to free delivery.

Retaining the husky construction which has characterized "Buffalo" fans for many years, the new Type "BL" has some outstanding quality design features.

The Type "BL" fan will be built in standard sizes and arrangements with rotor diameters from 12¼" to 108¾", to handle from 1,000 to 500,000 cfm.

You will want this superbly-performing new fan with the "Q" Factor* on your next job! Write for new Bulletin F-100, which contains complete engineering details, including performance tables and dimensions.

** The "Q" Factor — The built-in Quality which provides trouble-free satisfaction and long life.*

BUFFALO FORGE COMPANY

166 MORTIMER STREET BUFFALO, NEW YORK

Publishers of "Fan Engineering" Handbook

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Sales Representatives in all Principal Cities

COMPLETE FAN

1. Streamlined housing with outlet designed for most efficient air delivery
2. Anti-friction or sleeve bearings to suit job requirements.
3. Ample inlet collar for easy connection to ductwork.

WHEEL

1. Heavy gauge die-formed shroud full curvature for proper air flow in wheel.
2. Die-formed blades curved and backwardly inclined for stable air flow. Welded and riveted for maximum strength.
3. Solid back plate with extra heavy hub.

INLET

1. Furnished as standard, and exclusive with "Buffalo", these stationary inlet vanes reduce turbulence and assure rated air delivery in spite of unfavorable inlet conditions.
2. Die-formed inlet bell matches wheel shroud.

CERTIFIED RATINGS

AUTHORIZED BY AFM

For more facts circle 608 on Reply Card

join them together. The handling system is designed to save manpower and space in bringing the containers to the big spot welding machines and positioning them during the welding process.

From the center of the factory, individual sets of tracks were laid to each of the eight spot welders. By means of overhead electric hoists, the heavy tank sections are loaded on special wheeled fixtures which travel on the tracks. Designed to bring the tank seams into the electrode "jaws" at the correct height, these fixtures are rolled to the machines. The tanks are free to rotate

"I saw the cutest drill press for sale today."

on rollers as welding takes place. At the rear end of the fixtures, a Ryan-devised hydraulic cylinder actuates the tank alignment. By means of a hand lever, the machine operator can control tank alignment so that straight seam welds may be made over tapered tank sections.

The layout has saved both direct and indirect manpower. One man can perform all loading, conveying, positioning and unloading operations instead of the four-man, two-man teams which would have to be on hand.

Among the space and time saving devices at Ryan, the mechanisms used for loading and unloading machines rate high in effectiveness. This is especially true in the jet engine building where large aft frames and afterburners must be loaded into machines and furnaces.

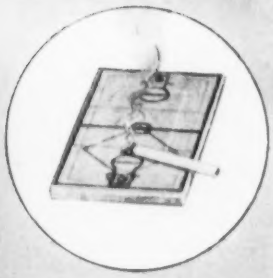
Ryan has installed a system of jib cranes equipped with air-operated hoists at every strategic location. These cranes are capable of handling up to 2000 lb components and are quite responsive to delicate control. Often, one hoist is located to serve one or more machines. With them one man can load a furnace car or big lathe with little effort and without tieing up other employees to help.

Ryan uses a number of ingenious loading devices which have been made to order by the Plant Engineering department, under D. H. Palmer. To load heavy trays of jet engine parts into Knapp annealing furnaces, Ryan engineers designed steel, grid-type conveyors which are

LET'S START WITH THE CAUSES OF *COSTLY FLOOR CARE*

Floor maintenance costs can be cut. Without skimping on protection. The way we help you do it is simple. First we look for the trouble spots that we've found are typical causes of extra expense. We analyze the treatments each of your floors has been getting. Then we cross-check these methods with those that have proved most successful in our years of experience with floors of all types, ages, conditions, and traffic situations.

After this analysis, we help you to organize your floor care on the most efficient basis. To set up a timetable for systematic cleaning, sealing, maintaining, and inspecting. To choose the particular products in West's broad line that will best fit your needs. At the right are a few examples.



Let's see how WEST products cut floor costs

West's broad line of floor products includes every item needed to clean, seal and maintain any type of floor. Economically! Here are three outstanding items.

LASTINCOTE

seals floors extra tight against dirt, oils, greases, scuff marks, scratches. Even a lighted cigarette won't mar the finish, although the wood underneath may char. Lastincote goes further and lasts longer. Penetrates deep into pores of surface, creating a hard, antislip coat. Completely neutral. Impervious to strong alkalis, soaps.

LUSTRECLEAN

is a triple action cleaner. Cuts maintenance man hours by cleaning, deodorizing and lightly waxing in one operation. No rinsing! Excellent for wood, composition tile, asphalt tile, linoleum, cement, terrazzo, painted and varnished floor surfaces.

KWYKWAX

provides a hard, antislip coating. Dries to high gloss in 20 minutes. Resists wet rainy-day traffic. Lasts and lasts for extra savings.

WANT DETAILS?

Tear out this page and mail with your letterhead

Dept. 52

I'm interested in:

☐ A FREE booklet packed with floor know-how and tips that can save hundreds of man hours a year.

☐ A talk with a West expert about my special floor problems. No sales pitch. No obligation. Just discussion and a demonstration if I want it.

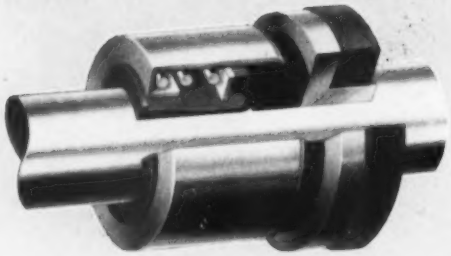
WEST DISINFECTING Company

West's broad line of products includes not only floor maintenance materials but also washroom service . . . disinfectants . . . deodorants . . . insecticides . . . cleaners . . . soaps . . . protective creams. West is also the exclusive distributor of Kotex Sanitary Napkins sold through vending machines.

42-16 West Street, Long Island City 1, N. Y.

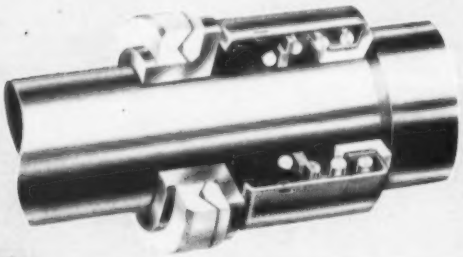
For more facts circle 609 on Reply Card

Garlock "Package" Seals
FOR ROTATING PUMP SHAFTS



Type BB-21A—Garlock Package Seal of standard construction with brass shell, brass washer, and Buna-N bellows.

	TYPE BB-21A	TYPE AA-21A
Liquids	For water, oils, alcohol, solvents (except aromatic, chlorinated and ketone types) and other liquids (except strong acids).	For very strong acids, oils, solvents (including aromatic, chlorinated and ketone types) and all other liquids.
Equipment	Rotating shafts of centrifugal pumps, process pumps, chemical pumps, agitators and similar applications.	
Sizes	For shafts from ⅜" to 3" diameters.	
Temperatures	With Buna-N bellows up to 212°; with silicone bellows up to 450° F.	Up to 450° F.
Pressures	Up to 150 p.s.i.	Up to 150 p.s.i.



Type AA-21A—Garlock Package Seal with hat-shaped "Teflon" drive ring, brass or 316 stainless steel shell and washer, "Teflon" 'O' ring, and "Teflon" two-piece vibration ring.

✓ CHECK THESE IMPORTANT FEATURES

- ☐ Occupy very small space
- ☐ Completely assembled—ready to install
- ☐ Proven performance at low cost
- ☐ Both types are dimensionally interchangeable

In both of these Package Seals, a leakless seal is provided by a positive contact between carefully lapped metal-to-carbon mating surfaces. All metal parts in both types are available in plated-brass, Ni-Resist, stainless steel with malcomized face, Garlock "B" iron, and others.

For complete details, ask your Garlock representative or write us about your sealing problems.

THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK
In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.
Branch Offices in Most Principal Cities

GARLOCK

PACKINGS, GASKETS, OIL SEALS,
MECHANICAL SEALS,
RUBBER EXPANSION JOINTS

For more facts circle 610 on Reply Card

hydraulically moved into the furnace. Raised rails carry the trays back and forth. The system also shunts the trays to either side of the loading area so that the furnace can be unloaded and reloaded with a single opening of the door.

These mechanisms save manpower but, most important, they allow the furnace operators to stay on the job by removing them from the hot blast of the open furnace. With push-button controls, the operators can work at a safe, comfortable distance. Heat lost through open furnace doors is kept to a minimum by the fast action of the loading devices. If a quick quench following heating is prescribed, the loader is a positive means for meeting the requirements.

Ryan performs a ticklish quick quench job with another type of conveyor which was also designed and built by Plant Engineering. With certain aluminum alloys, it is necessary to heat the metal to 925 F in a molten salt bath, then quench it in cold water. This strengthens and hardens the metal. To obtain maximum strength, the hot metal must be quenched within 10 seconds after removal from the molten salt bath.

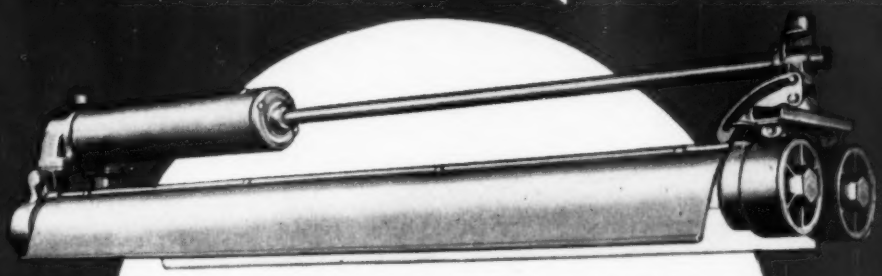
Ryan designed a large conveyor, operated by a variable-speed motor, with brakes, and a chain drive. Damping devices are used to prevent the conveyor basket from swaying as it moves. In operation, the conveyor slowly removes the parts from the hot bath, speeds them along a horizontal path to the water quench tank and gently lowers them into the cold water. This is accomplished in less than ten seconds. Care in removal and insertion of the parts is mandatory to prevent warping of the hot metal.

To transfer parts throughout the factory in the simplest fashion, Ryan designed and built a variety of custom tailored racks. These carriers are made of welded steel frames with padded separators which are tailored to fit each type of part. They are equipped with large wheels for easy movement.

By designing the racks for the parts, it was found that a great many more components could be accommodated than with the standard "tote" boxes. For instance, 204 jet engine struts can be carried in one mobile rack which takes little more space than the old type boxes that carried only forty. Another typical rack neatly contains thirty combustion chambers in contrast to the nine which could be placed in an ordinary box.

These racks make better use of factory floor space by their capacities for storing parts. The parts are kept in better condition because they are separated and not shuffled together. Personnel like the racks because they are easier to push, load and unload.

CROUSE-HINDS High Efficiency LIGHTING EQUIPMENT . . .



Type EVF Explosion-Proof and Dust-Tight Fluorescent Lighting Fixtures
Slimline and Bi-Pin 1, 2, 3, or 4-Lamp

EV Series Explosion-Proof and Raintight Lighting Fixtures

. . . for Hazardous Locations

Crouse-Hinds explosion-proof lighting fixtures exceed the requirements for service in highly explosive atmospheres. They are designed to operate at a temperature below the ignition temperature of the gas-air or vapor-air mixture. They are so strong that they will resist internal explosions without damage and so tight that they will prevent the escape of flames or burning gases which might ignite the surrounding atmosphere.

Crouse-Hinds dust-tight lighting fixtures assure safety in locations that are hazardous because of the presence of combustible dust.

DL Series Dust-Tight and Raintight Lighting Fixtures

Type MDB-14 Floodlight

. . . for Wet and Corrosive Locations

Crouse-Hinds vaportight lighting fixtures are ideal for use in boiler rooms, powerhouses, shower rooms, tunnels, loading docks, building entrances, and all indoor and outdoor locations where exposed to moisture and rain, noh-explosive vapors and gases, or non-combustible dusts.

Hundreds of industrial lighting fixtures are listed in Crouse-Hinds Condulet Catalog.

V Series Vaportight and Raintight Lighting Fixtures

Type ADE-14 Heavy Duty Floodlight

. . . for Protection

Sabotage thrives in darkness. The most reliable and cheapest form of protection against night prowlers is LIGHT! Crouse-Hinds floodlights project powerful beams of light that bathe all approaches to your property with glaring radiance, killing darkness and shadows and compelling everyone to be more visible at night than in broad daylight.

The protective power of light should be used in all important municipal and industrial locations. The floodlighting of industrial plants serves a double purpose. It helps to boost production in addition to the security it provides.

Send for your copy of Bulletin 2565, "LIGHT! Protect Your Property."

Type DCX Searchlight

A Nationwide Distribution Through Electrical Wholesalers

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

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FLOODLIGHTS · AIRPORT LIGHTING · TRAFFIC SIGNALS CONDULETS

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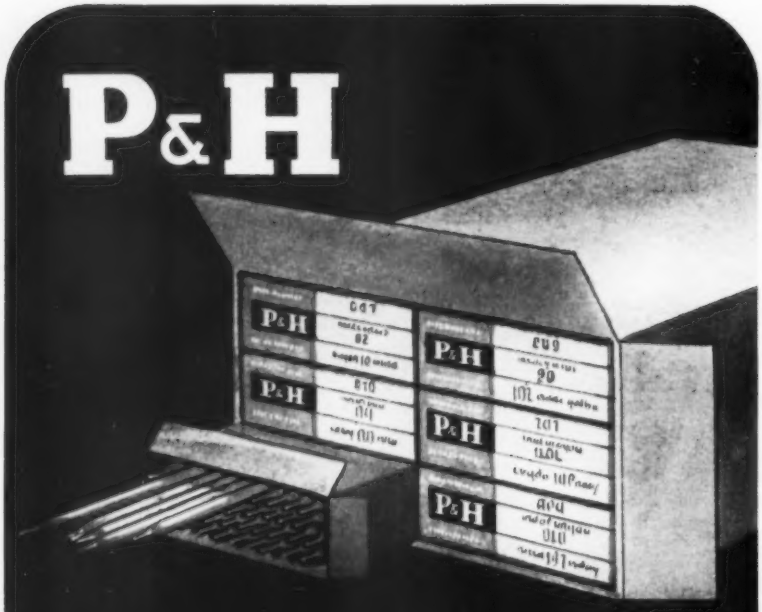
P&H



economical

Handy, small-package assortment of electrodes for repair and maintenance welding

P&H

Maintenance Pack

7 different electrodes
(Approximately 27 lbs.)

- ★ AC-3, 1/8", 5/32", 3/16" — For all position welding of mild steels and sheet metal. AC or DC.
- ★ AC-1, 5/32" — For mild steels. AC or DC.
- ★ 70LA2, 5/32" — For high-carbon, alloy, high-sulfur, free-machining, cold-rolled, and other hard-to-weld steels. Ideal for steel casting repairs. AC or DC.
- ★ Harstain, 1/8" — For spring steels and stainless steels of all kinds. AC or DC.
- ★ Nicast, 1/8" — For machinable welds on cast iron. Nicast welds are strong and non-porous.

$13.90
for complete assortment

Why buy seldom-used electrodes in quantities larger than you need? Now, in one convenient package, you can keep some of each type on hand economically — and get replacement packages as you need them.

The P&H Maintenance Pack equips you to do all kinds of repair and maintenance jobs with the *right* electrode. All rods are packaged to stay dry — and are clearly labeled to make selection easy.

Be ready for emergencies. Save time, trouble, money. Order a P&H Maintenance Pack from your P&H representative or local distributor. If you don't know who he is, write for his name.

P&H WELDING DIVISION
HARNISCHFEGER CORPORATION
4496 West National Ave., Milwaukee 46, Wis.
2497

the P&H *Line*

For more facts circle 612 on Reply Card

INDUSTRIAL FILMS

Mechanical Seals

THEORY, purpose, use, construction and maintenance of mechanical seals is described in detail in a new color film. The history of the development of this type of seal is also presented.

The film is available for showing to company engineering and maintenance meetings upon application to L. P. Kimball, Byron Jackson Company, Los Angeles 54, Calif.

Development of a Water Softener

THE STORY OF THE DEVELOPMENT of a home water softener from a research department pencil sketch to final installation in a home is portrayed in a new slide film, "Permutit at Work." It shows all the functions and teamwork required by The Permutit Company's various departments and plants in designing, developing, manufacturing and testing component parts and the complete unit.

The black and white film, running time 29 minutes, is available from the company at 330 West 42nd St., New York 36, New York.

Stainless Steel Welding

"RESISTANCE WELDING of Stainless Steel," a new picture just released by Allegheny Ludlum Steel Corporation, discusses spot welding, seam welding, projection welding and butt welding. The film makes use of animation and drawings to clarify the picture material. Running time is 22 minutes.

It is available on free loan from the corporation at 2020 Oliver Building, Pittsburgh 22, Pa.

ABC of Atomic Energy

"A IS FOR ATOM," A 15-MINUTE motion picture education in nuclear fission and atomic energy, has been made available to the central states area.

The full-color, 16 mm, animated cartoon film features a lively little character called "Dr. Atom," who

Bump that assures positive results

When fire strikes, seconds count . . . your fire extinguishers must be the right type and function properly from the very start . . . failure means serious losses.

The growing popularity of the highly effective powdered dry chemical fire extinguishing agent may be hampered by a drawback . . . settling or packing can occur after a lapse of time. However, with C-O-TWO Dry Chemical Type Fire Extinguishers there's no chance of this happening.

The exclusive inverting and bumping design of C-O-TWO Dry Chemical Type Fire Extinguishers provides mechanical breakage of the dry chemical by shifting its position in the cylinder. This outstanding mechanical breakage, plus continuous inert gas pressured agitation or fluffing of the skillfully blended free flowing dry chemical, guarantee lasting, foolproof fire protection.

No other brand on the market today gives you this extra margin for positive results. Inverting and bumping is only one of many unique design advantages that make C-O-TWO Dry Chemical Type Fire Extinguishers your best buy for killing flammable liquid and electrical fires, as well as surface fires involving ordinary combustible materials.

With C-O-TWO Dry Chemical Type Fire Extinguishers the heat-shielding dry chemical is a non-conducting, non-abrasive, non-toxic, finely pulverized powder compound . . . blankets fire instantly. Sizes range all the way from 4 to 150 pounds capacity . . . all fully approved by the Underwriters' Laboratories, Inc., Factory Mutual Laboratories and Government Bureaus.

Act now for complete free information on these top quality, sure-acting fire extinguishers. Remember fire doesn't wait . . . get the facts today!

C-O-TWO

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers
Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

C-O-TWO FIRE EQUIPMENT COMPANY
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Sales and Service in the Principal Cities of United States and Canada

AFFILIATED WITH PYRENE MANUFACTURING COMPANY

For more facts circle 613 on Reply Card

Here is the way one plant engineer synchronized the operation of a liquid valve with the motor operating the pump.

He installed a MICRO switch with a roller arm actuator so that opening of the valve handle automatically operates the switch and closes the motor circuit. Closing the valve shuts off the pump motor. "By using this switch with its adjustable lever arm we have a freely adjustable feature not heretofore attainable with any other switch," he says.

Keep up to date on hundreds of other live, practical ideas by reading MICRO Tips. This MICRO publication is full of specific ways plant engineers have made their present equipment safer, more efficient and more productive by installing MICRO switches. Just tell your MICRO distributor you would like to receive MICRO Tips regularly.

MICRO A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY
MAKERS OF PRECISION SWITCHES
FREEPORT, ILLINOIS

For more facts circle 614 on Reply Card

explains the development of atomic energy and its potential application in the fields of medicine, agriculture, industry and science.

"Dr. Atom" takes his audience to "Element Town," introduces the various atom families and, at the same time, he describes the processes of nuclear fission and the problems of harnessing the force of the atom. The accuracy and clarity of the film have been attested to by the Atomic Energy Commission, scientists and educators.

Prints may be borrowed at no cost other than postage from the General Electric Company film library at 840 S. Canal St., Chicago 80, Ill., for showings to management and employee groups, high school and college classes, science groups, etc.

Directory of Safety Films

THE 1953-54 EDITION of the National Directory of Safety Films is now available.

The directory provides the plant safety man with a comprehensive listing of 963 motion pictures and slidefilms for use in training personnel in occupational accident prevention. Films on home and traffic safety are included for the off-the-job safety program.

In an effort to make the directory as complete as possible all agencies known to the National Safety Council were consulted. Films in the related fields of first aid, fire prevention and civil defense are included. The directory will be kept up-to-date with supplements which will be published quarterly.

Copies of the directory are available for 75 cents each from the National Safety Council, 425 North Michigan Avenue, Chicago 11, Illinois.

Working Safely with Electronics

BASIC SAFETY PRECAUTIONS that should be followed to avoid needless injuries and fatalities from electric shocks when working with electronic equipment, are described in a new film. Titled, "Safety Precautions for Electronics Personnel," it shows examples of working habits of various electronic personnel, to dramatize the need for giving constant care and attention to one's working surroundings, lighting, tools, safety equipment and so on.

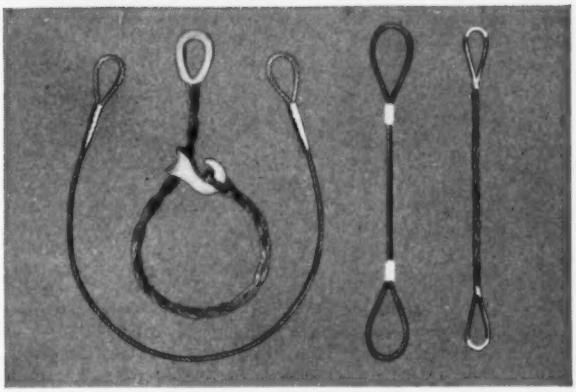
Made in black and white, the 16mm film runs for 18 minutes. Charges are for transportation and insurance. It is available from Audio-Visual Aids, Civil Aeronautics Administration, W-153, Washington 25, D. C.

PREFORMED INTERNALLY LUBRICATED

Wire Rope

for cranes, hoists, elevators, and all equipment

From Macwhyte's complete line of a thousand and one sizes and types, you get the right rope for your equipment. Thoroughly lubricated, PREformed, engineered to give long, low-cost service. *Send for Catalog G-15.*

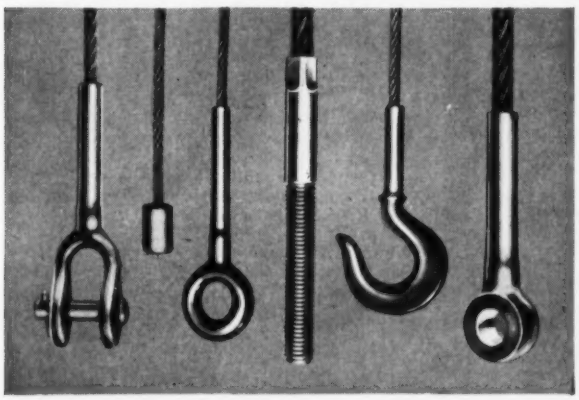


WIRE ROPE

Slings

for lifting and moving materials, equipment in production or maintenance

There are hundreds of types and sizes of Macwhyte Round-Braided, Flat-Braided, Single-Part, and Grommet Slings. All are custom made in length, capacity, and flexibility to meet your needs. *Send for Catalog S-8.*



WIRE ROPE

Assemblies

for machine parts, controls, and operating devices

Macwhyte Safe-Lock wire rope assemblies are made to order in length, strength, and flexibility desired. Terminals are permanently attached to one or both ends. There are many standard types. *Send for Catalog 5201.*

MACWHYTE

1028-SW

These catalogs available on request

MACWHYTE COMPANY

2902 Fourteenth Avenue • Kenosha, Wisconsin

Mill depots: New York • Pittsburgh • Chicago
St. Paul • Fort Worth • Portland
Seattle • San Francisco • Los Angeles
Distributors throughout U.S.A.

For more facts circle 615 on Reply Card

New HEAVY-DUTY TENNANT MACHINES HELP YOU SAVE 35% to 80% in FLOOR CLEANING COSTS!

These new machines are typically TENNANT—designed for tough round-the-clock jobs . . . built to save you 35% to 80% in cleaning costs. And they're engineered for extra *years of service.*

You'll like their new power, speed and convenience—for pulverizing grease-caked grime . . . power sweeping . . . high speed dry-cleaning . . . and many special uses. Gas, electric or battery-powered; 8" to 48".

WRITE TODAY for details. We'll gladly estimate your plant's savings.

MODEL R SCARIFIER for cleaning grease-caked aisles. Moves with traffic. Faster than 6 to 18-man crew! Cleans 36" path; dumps hydraulically.

MODEL 75 SWEEPER—New! Pays for itself in about 1 to 6 months. Sweeps 100,000 sq. ft. per hour. Has instant reverse; dumps in 30 seconds.

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Survey of Pension Plans

PENSION PLANS with Less than 100 Participants. Size 11 by 8½ in.; 18 pp; paper bound. Available from the Employee Benefit Plan Review, 166 W. Jackson Blvd., Chicago, Ill. Price $5.00.

THIS REPORT includes the plans of some plants that have more than 100 employees; however, the number that participates in pension plans in each case is less than 100.

The first eight pages go into detail on factors used to show the different plans. The remaining portion of the booklet gives the specific plans of firms that were surveyed. The list of 317 plans is broken down into several groups which include: manufacturing firms; retail-wholesale firms; service firms and others.

Along with the number of employees and the number participating, this publication covers the following: eligibility; vesting; retiring income; death benefits before retirement; and cost of plan.

Plans in this booklet can be used to pattern arrangements in small plants instead of adopting widely publicized plans of large corporations.

Heat Transfer Charts

INDUSTRIAL HEAT TRANSFER by F. W. Hutchinson. Size 9 by 6 in.; 326 pp including index; 1952 edition; cloth bound. Published by the Industrial Press, 148 Lafayette St., New York 13, N. Y. Price $6.00.

OVER 100 working charts are featured by this book. From these, direct solutions of heat transfer problems can be obtained for 70 industrial fluids ranging from air and acetylene to sulfur dioxide and water.

As a further aid, the page opposite each graph gives the equation for the graph, its limitations, its extension, and the references to the discussion of that equation in the text.

The six chapters in the book are: Introduction; conduction; radiation; convection; combined heat transfer; and forced convection.

Information in this book should be useful to students of heat transfer and to practicing engineers who must make accurate calculations of heat transfer coefficients and rates in designing and specifying actual installations.

Solving Industrial Waste Problems

INDUSTRIAL WASTES: Their Disposal and Treatment. ACS Monograph 118, edited by Willem Rudolfs. Size 6 by 9 in.; 497 pp including index;

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cloth bound. Published by Reinhold Publishing Corp., 330 W. 42nd St., New York 36, N. Y. Price $9.50.

WRITTEN BY A GROUP of experts in the various phases of the waste disposal field, this monograph covers the problem thoroughly.

Beginning with a discussion of the problem itself, and the relation of the problem to stream pollution, the chapters of the book pick up industries one at a time, and look into their particular and peculiar problems.

With equipment descriptions and flow diagrams interspersed in the text, actual treatments are discussed as studied by the authors, and their findings present a pattern of results that functions as a guide for an engineer faced with a waste disposal problem in most any industry.

A sampling of the industries included in this book lists milk products, canning and food freezing, meat packing, fermentation industries, tanning, pulp and paper, steel production, and petroleum.

Welding Figures and Facts

WELD STANDARDS. Size 11 by 8½ in.; illustrated; loose-leaf sheets in paper cover; 19 pp. Published by the Lincoln Electric Co., Cleveland 17, Ohio. Price $1.00 in U.S.A.

THESE STANDARDS have been prepared to enable engineers acquire cost and quality control over welding operations. The material appears on tracing paper so that it can be reproduced to distribute standards for communicating welding procedure on drawings.

For specific plate thicknesses, the following information is offered: electrode type and size; polarity and current; electrode melt-off rate; arc speed; number of passes or beads; feet of joint welded per hour; and pounds of electrode required per foot of weld.

The foregoing factors are specified by using Weld Standard designations and the regular American Welding Society symbols.

Getting the Most out of Taxes

TAX SHELTER IN BUSINESS by William J. Casey and J. K. Lasser. Size 8½ by 11 in.; 156 pp; plastic leather binding. Published by Business Reports, Inc., 1 Main St., Roslyn, Long Island, New York. Price $12.50.

IN THIS RESEARCH STUDY, the authors discuss the main strategies and policies through which a business may hope to hold its own and even to grow in the face of today's tax structure.

Some of the examples show how Henry Kaiser and Robert Young have used losses to acquire profitable businesses; how Sears, Roebuck and Co. shifted its financing operations to realize the savings which borrowed capital yields today; how

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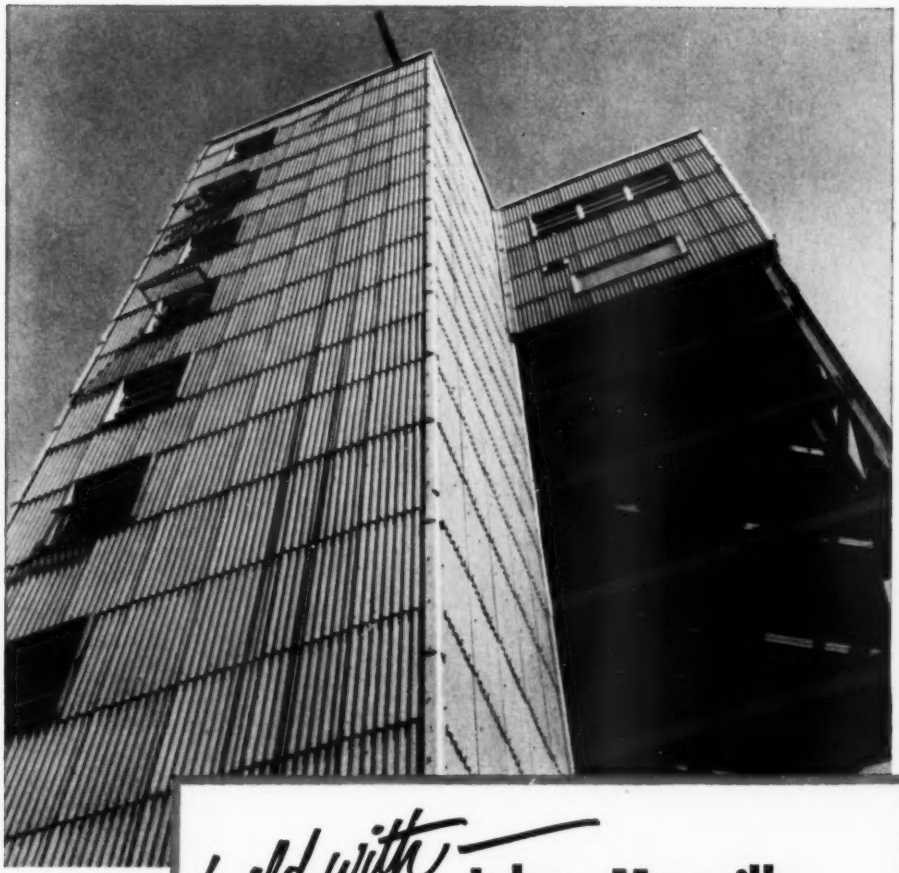

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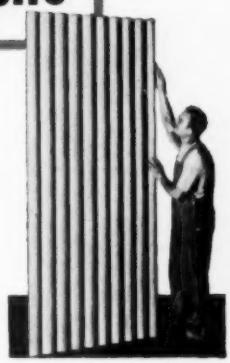

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hotel man Conrad Hilton used various tax deals to build his $10 million hotel chain; and many others.

This research study also discusses various ways in which plant and equipment can be charged off quickly. It also explains the favorable economics of leasing plant and equipment and selling physical assets and leasing them back.

Books of the Gilbreths

THE WRITINGS OF THE GILBRETHS edited by W. R. Spriegel and G. E. Myers. Size 9 by 6 in.; 513 pp including index. Published by Richard D. Irwin, Inc., 1818 Ridge Road, Homewood, Illinois. Price $7.35.

THIS BOOK HAS been made possible by the editing of a number of volumes on various subjects prepared by the Gilbreths. The editors worked through these books and eliminated material that is no longer technologically valid.

Included in the book are the findings and studies that are significant in making changes in the lives of both labor and management.

One of the late Frank Gilbreth's contributions was the improvement of bricklaying. This volume includes an account of this system as well as on his system for concrete work. In addition, his field system is also covered by this book. The latter is a method that cuts cost in keeping track of time and materials without going into extensive work by a clerk.

Other subjects that the book includes are: scientific management; motion study; fatigue; motion study for the handicapped; and the psychology of management.

Screw Thread Data

ASME THREAD MANUAL edited by Henry R. Cobleigh. Size 9¼ by 7⅜ in.; illustrated; paper bound. Published by the American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y. Price $2.50.

A LONG STRUGGLE, stretching over many years, preceded the final agreement on thread unification. It was in the fall of 1948 that government and industrial representatives of three nations signed the Declaration of Accord. This called for general interchangeability of threaded products made by Canada, Great Britain and the United States.

In this book, one finds unified standards that were set by the Accord in addition to American standards. This information has been prepared in abridged form and should be useful not only for people in the drafting room but also those in the shop.

In addition to the tables on thread dimensions, the book's appendixes include the following topics: formulas for stress and shear areas; drilling for taping; three-wire measurement of pitch diameter; metric limits of size; and terminology.

Measurement by Instruments

MEASUREMENT TECHNIQUES in Mechanical Engineering by R. J. Sweeney. Size 9¼ by 6 in.; 309 pp including index; illustrated; cloth bound. Published by John Wiley & Sons, Inc. 440 Fourth Avenue, New York 16, N. Y. Price $5.50.

IN THIS BOOK, the reader will find principles on which design of measuring instruments is based. In addition, the book offers information on making correct measurements on available instruments.

Not only the function of measurement is given attention in the book but also the service of instruments as signaling devices for automatic controllers. The book also covers the techniques for performance testing of equipment. This could be applied on such items as pumps, compressors, and engines.

A few of the subjects that the book covers are the following: tachometers, Wheatstone bridge, vacuum gages, radiation pyrometers, volumetric flow measurement, fuel calorimeters, Orsat gas analysis, and proportional control.

This book has been intended for both students and engineers; knowledge of elementary physics and calculus is desirable.

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(Continued from page 36)

trucks and tractors are pictured in 8-pp Bulletin 534. These illustrations, from a food warehouse, show how such control saves time in the movement of materials and goods. Barrett-Cravens Co.

132 Hoist Controller—Folder 9300 describes operation of a-c and d-c crane controllers and points out advantages in precision handling application. Illustrations show controller and parts, with explanation of construction. Hook-speed curves resulting from operation of a 25-ton crane-hoist equipped with controller, and photos of installations are included. The Electric Controller & Mfg. Co.

133 Control for Power Machines—Twelve-pp Catalog 59 on Microtrip electric clutch control for power machines explains how this control speeds production and affords exceptional safety to operator. Charts show control equipment required for various machine operations, and text and photos explain how the control provides safety in operation and during "set-up." Auxiliary and accessory equipment is also pictured. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

134 Proportioning System—Bulletin 0351, 6 pp, pictures and describes company's new proportioning and materials handling system for automatically making up formulated mixes of bulk products. The operation of the electronic control system, rates, accuracies and possibilities of remote recording are explained, also the formulating operation, feeding, weighing and mixing. Includes a large schematic drawing of a typical Select-O-Weigh system. Richardson Scale Co.

PROTECTIVE COATINGS

135 High Cost of Cheap Paint—Service Bulletin 120 is an educational leaflet on the economics of protecting metal with paint. Contains chart showing probability of early failure correlated with paint film thicknesses. Data from plant records shows comparative costs of labor and material required to attain minimum thicknesses with variously priced paints. Carboline Co.

136 Reference Data on Insulation Protection—This booklet, about 20 pp, is a revised reference manual describing in detail 36 of company's coating and adhesive products for use in the installation and surface protection of industrial insulations. Technical data, recommended uses, citation of appropriate specifications and other facts are given. Manual is available to qualified plant engineers concerned with thermal or acoustical insulations and the protection of insulated pipelines, equipment. Benjamin Foster Co.

MECHANICAL POWER TRANSMISSION

137 Speed Reducers—Sixteen-pp Booklet B-5646, covering a complete line of speed reducers, discusses features of the equipment, manufacturing techniques, and applications. Standard ratios available for all types of speed reducers are given. Special units developed for right-angle drives, and in-line drives are discussed. Other speed reducers developed for particular industries are described. Westinghouse Electric Corp.

138 Fluid Drive—Of value to plant engineers interested in obtaining adjustable speed operation in a range from 100 to 2500 hp is 24-pp Bulletin 9319, illustrated in color. Covers company's Type VS, Class 4 Gyrol fluid drive, explaining its principle of operation and illustrating its use with forced and induced draft fans, centrifugal compressor and reciprocating pump. Advantages of the drive are detailed, and component parts described. Selection data, dimensions and an illustrated description of auxiliary equipment are also provided. American Blower Corp.

139 Friction Clutch Data—Form S31-53 is an illustrated engineering data sheet covering company's new line of torque-limiting slip type friction clutches designed to provide overload protection for machine drives by functioning as an automatic shear pin mechanism. Includes dimensions and capacities of standard 4½-, 5½- and 6½-in. dia adjustable clutches, also data on roller chain sprockets for use with them. Morse Chain Co.

140 Belt-Center Calculator—Belt-center selection for fans, and compressors, determination of horizontal distances between shaft centers, and checking equipment clearances is easily calculated with this belt-center calculator. Claimed accurate to ⅛ in., it provides information in graph form. On its reverse side is a fan engineering data sheet giving NAFM and NEMA data, nomenclature. The Korfund Co., Inc.

141 Miniature Ball Bearings—Form 53-54, 20 pp, presents technical data on bearings in sizes from 0.100 in. to 0.375 in. OD, covering radial, angular contact, pivot and thrust types. Photos, scale drawings, and dimension charts are provided. Applications of these bearings and availability of special types are discussed. Booklet also gives data on load rating, speeds, tolerances, clearances and lubrication. Miniature Precision Bearings, Inc.

WELDING, HARD-FACING, MACHINE SHOP EQUIPMENT

142 Arc Welding Procedures—A reference table designed to help fabricators of tubular materials, Technical Data Card 155 outlines details to be observed in joining similar and dissimilar alloys by arc welding. It covers carbon, intermediate chromium molybdenum alloy steels and stainless steels and outlines the electrodes to be used and suggests preheating and postwelding heat treatment. Tubular Products Div., The Babcock & Wilcox Co.

143 Welding of Nickel Alloy Steels—A study of the various welding techniques for nickel alloy steels, including some of the newer inert gas processes, is presented in 44-pp Bulletin A93. Discusses electrodes, preheat treatments and post heat treatments; also discusses typical results that can be expected for the low alloy high strength steels, low carbon and medium carbon engineering alloy steels and special steels. Booklet is illustrated with photos and design drawings, includes tables of properties, test results. The International Nickel Co., Inc.

144 Electrode-Selector Chart—Designed to present up-to-date information on company's welding electrodes, this 4-pp chart (Publication GEC-657E) contains condensed data on mild-steel, low hydrogen-low alloy, low alloy-high tensile, hard-surfacing and stainless-steel electrodes. Tabular material includes welded properties, metal deposit analysis, specification requirements met, major competitive types, advantages and applications for each type of electrode. General Electric Co.

145 Fast Hard-Surfacing—Bulletin 53B presents some applications of the Sprayweld process which combines metal-spraying and torch-fusing for simplified, high-speed hard-surfacing. Cites use of this process on acid sludge pump rods, on guide rolls at a steel rolling mill, on deep-well irrigation pump rods, agitator shafts, and other parts. Gives advantages of the process; illustrates four stages involved. Metallizing Engineering Co., Inc.

October, 1953

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146 **Vapor Degreasers**—Following a definition of degreasing, what it does and where it is used, this 12-pp booklet points out advantages offered by manufacturer's degreasing equipment—efficiency, constant distillation, economy of installation and operation, safety. Describes and pictures batch type models, combination type degreasers and Rotomatic units, as well as conveyor type degreasers and metal parts washers. Phillips Mfg. Co.

147 **Steel Shot Abrasive**—Bulletin 89, 8 pp, describes a new blast cleaning and peening abrasive. Factors important to the economical and efficient consumption of steel shot abrasive, and a discussion on how to perform abrasive tests under actual operating conditions are provided. American Wheelabrator & Equipment Corp.

148 **Facts on Crush Truing**—This 16-pp technical bulletin answers some of the questions asked about crush truing. It covers its applications, equipment required, shapes and types of wheels used, grains and grades of abrasives recommended, crushing speeds and feeds, wheel speeds, coolants and quality of work ground. Also provides a comparison of diamond truing and crush truing and tells advantages of both. Norton Co.

ENGINES, GENERATING PLANTS

149 **Electric Generating Plants**—This 32-pp pocket size booklet gives general information on selection of engine driven electric generating plants and tells their history. A-c, d-c and battery charging electric plants and their operation, are discussed. Gasoline, diesel, gas engines and cost of operation and installation of each are also discussed. Differences of engine cooling are compared, starting methods described and a summary of points to remember in selection are included. D. W. Onan & Sons Inc.

152 **Engine Application**—Form 30743 titled, "More Power at Less Cost," is an 8-pp booklet covering six sizes of engines and containing photos illustrating applications of industrial engines, diesel electric sets and others. Explains how company designs these units to suit specific needs with the accent on capacity, economy, compactness. Caterpillar Tractor Co.

THIS MONTH'S LITERATURE OF MERIT tells how to get more production from motors . . . select a portable heater . . . plan a record system

150 **Productive Maintenance**—Publication GED-1691 is a pocket-size 104-pp source of information of value to plant engineers who want to get more production from their present motors, generators and control equipment. Besides general maintenance suggestions, the booklet contains trouble shooting charts and recommended renewal parts guides. Also provides wire and cable data and includes a section of formulas and other data pertaining to motors and generators. General Electric Co.

151 **Buying a Portable Heater?**—Stressing safety factors involved, this 40-pp well-illustrated booklet, "Guide to the Selection and Use of Portable Space Heaters," analyzes temporary heating equipment from standpoints of personnel well being, property protection and fire and accident prevention. Classifies basic types of direct- and indirect-fired portable heating devices, giving their advantages and limitations. Provides a guide for evaluating portable heaters in terms of design, construction, operation and safety. Also discusses costs, heat output and fuel. Herman Nelson Div., American Air Filter Co., Inc.

153 **Record System Planning**—"How to Plan a Successful Record Retention and Destruction Program" is a 16-pp illustrated management study. Tells how to analyze records according to importance, evaluate retention program, inventory records; discusses active and inactive file cycling. A table shows suggested length of time to keep various company records. Describes and pictures record storage equipment, and includes chapters on microfilming. Diebold, Inc.

MATERIALS HANDLING

154 **Palletizing System**—This 16-page bulletin makes specific recommendations for making the most of storage space and sets forth points to be considered when selecting a storage system. Essential data required for designing and pricing are given. Types of pallets, hardware used in palleting and shelving, tiering and pallet racks are described and illustrated. Pictures installations and lists materials which can be stored. The Paltier Corp.

155 **Wire Conveyor Belts**—Bulletin 107 illustrates various basic constructions available in woven wire conveyor belts and pictures several installations. Describes accessories for handling unusual products. The Cambridge Wire Cloth Co.

156 **One-Handling System**—Eight-pp Catalog JT-53 explains and pictures company's Jak-Tung handling system in which a platform truck lifting unit is used to save manpower and time. Shows how such a unit can be trucked manually, moved by fork- or platform-type lift truck, or used for storing materials. Thomas Truck & Caster Co.

157 **Hoists for Trucks**—Bulletin 404 describes and pictures battery-operated electric hoists of same construction as company's well-known Budgit portable hoists, but designed for mounting on trucks. Although these hoists have 12-v motors and controllers, they may be installed on trucks with 6-v system by adding another 6-v battery. A wiring diagram shows an inexpensive arrangement for such operation. Specifications, prices are included. Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc.

158 **Improved Storage Containers**—This 8-pp booklet shows how company's wire Cargotainers and pallets afford efficient use of storage space. Explains how the containers fold, stack, afford visual inventory and are adaptable to handling by mechanized equipment. Case histories and before-and-after photos show improved use of space and savings in handling costs. Pittsburgh Steel Products Co.

SANITATION

159 **For Maintenance, Sanitation**—A 36-pp catalog of maintenance products, this booklet covers absorbents, bactericides, general and special cleaners, dishwashing equipment, insecticides, and vaporizers and waxes. Describes each product briefly, tells where to use it and gives packaging information. The Diversey Corp.

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160 Sanitary Engineering—This 34-pp brochure shows by text and pictures how company has incorporated new developments in waste engineering in the design of sewage and industrial waste projects for municipalities and industries. About 50 installations are shown. In a pocket of this book is a smaller booklet of project and client lists. Gilbert Associates, Inc.

161 One-Piece Underdrains—Sixteen-pp Bulletin UF-3 describes company's Unifilter Blocks for trickling filter beds of sewage disposal plants. Describes types and shapes available, pictures several typical installations of these underdrains. Also provides typical construction details for trickling filters. Natco Corp.

162 Efficient Chlorination—Pocket-size Form A-705, 24 pp, outlines the uses of Pittchlor, a calcium hypochlorite with a minimum of 70 per cent available chlorine. The advantages of this product for water and sewage treatment and general sanitation are listed, and a table gives solution strengths for a number of applications. Columbia-Southern Chemical Corp.

SILICONES

163 Silicone Packing Products—Bulletin AD-147, 8 pp, describes silicone rubber diaphragms, gasketing, sheet packing, oil seals, rings, insulation tape, rod and valve stem packings, and molded shapes for many industrial uses. Characteristics and applications of silicone rubber are described. The Garlock Packing Co.

164 Silicone Facts—This attractively illustrated booklet presents some of the "fabulous facts" about silicone products. Cites performance of baking pan glaze, greases and lubricants, electrical insulation, water repellent finishes for textiles, silicone rubber, fluids for damping, masonry water repellents, defoamers and other products. Dow Corning Corp.

OTHER EQUIPMENT

165 For Varying-Load Ventilating—The Airjector, a powered rotary type roof ventilator which may be operated as a power ventilator, or with motor turned off to provide gravity heat exhaust. Fully illustrated, describes construction; gives sizes and capacities. Tells how to convert company's other rotary units into Airjectors by means of a conversion collar, and describes a model designed to operate at low noise levels. The Swartwout Co.

166 Spreader Stoker—Sixteen-pp Bulletin 800 describes manufacturer's Type C-C RotoStoker, a relatively small spreader stoker offering continuous cleaning and ash discharge advantages of larger units, without need of a basement for ash removal. Explains this continuous cleaning feature in detail, along with other operational advantages of the stoker which is adapted to modern steam boilers with output capacities of about 5000 to 75,000 lb of steam per hour. Photos show several installations. Detroit Stoker Co.

167 Nylon Clad Wire Rope—This 16-pp booklet describes the properties and qualities of Wirelon ropes. Gives descriptions, specifications and application information on these nylon covered wire ropes which are constructed with a high strength steel core and a hard jacket of transparent nylon. Illustrates standard and flexible types, gives sizes and breaking strengths. Generously illustrated, includes a sample of Wirelon. Rochester Ropes Inc.

168 Waterproof Adhesives—Eight-pp Bulletin C-3-149, on company's Penacolite resorcinol adhesives, discusses origin of the resorcinol-formaldehyde adhesives and explains types now made for various applications. Phenol-resorcinol-formaldehyde formulations are also discussed. Recommendations of types best suited for gluing of oak, for general assembly bonding, for durability with economy are made. Chemical Div., Koppers Co., Inc.

169 Hydraulic Hose Selector—The Wiretex rubber covered hydraulic hose selector is offered to users of hydraulic control hose. Starting with any known factor—the ID, OD, minimum burst working pressure required etc.—a plant engineer can use the selector to determine the proper hose for the operation on which it is to be used. Republic Rubber Div., Lee Rubber & Tire Corp.

170 Plating Anodes—Bulletin 141, 8 pp, provides information on copper, lead, zinc, tin, tin-lead, cadmium, cadmium oxide and brass plating anodes. Data on sizes, shapes, compositions and other characteristics are included in the catalog to make easy the ordering of the proper anode for any kind of job. American Smelting and Refining Co.

171 Steel Reservoirs, Standpipes—This 24-pp booklet pictures installations of reservoirs of 50,000- to 10,000,000-gal capacity, having cone, umbrella or ellipsoidal roofs and ornamental structures with special architectural features. Provides table of standard capacities, information on foundations, data on use of suction tanks for fire protection. Chicago Bridge & Iron Co.

172 For Military Packing—Here's a 12-pp booklet on shipping containers for a wide range of military equipment—from tank parts to food and medical supplies. Illustrated with photos throughout, shows how the various crates, boxes and other containers are constructed for strength and to protect materials. General Box Co.

173 Beryllium Directory—Beryllium products, including pure metal, oxide and alloys, are described in the 20-pp "Beryico Product Directory." Covers concisely the various commercial beryllium products offered by company; master alloys, copper wrought products, casting ingots, also castings, nonsparking tools, forgings, beryllium oxide, beryllium metal and ferroberyllium. The Beryllium Corp.

174 Dispersions for Industry—This folder contains a list of 37 dispersions of colloidal graphite, molybdenum disulfide, vermiculite and zinc oxide. Typical applications, densities, carriers, and other data are given. Acheson Colloids Co.

175 Acidproof Sump Pump—Bulletin SP-53 describes a sump pump designed for difficult pumping where heads to 35 ft and flows to 75 gpm are required, and for handling acid sludges, corrosive and foamy products with solids in suspension. Shows how the pump is built, tells how it is installed and operated. The Gallgher Co.

176 Water Conditioner—Eight-pp Bulletin 3869 describes the company's Package Water Conditioning Plant as a versatile and self-contained unit which chlorinates, coagulates, clarifies, filters, neutralizes, dealkalizes and softens raw water supplies. Lists component parts of the water conditioner, and explains principles of operation. Gives ratings, capacities and sizes. The Permutit Co.

177 Blowers and Exhausters—Bulletin B-6, 32 pp, gives information on centrifugal blowers and exhausters for air or gas handling. Typical applications are illustrated and described. Performance data is presented for air blowers and exhausters with cast iron housing ranging from 1 to 7 psi; for air blowers and exhausters with fabricated steel housings, ½ to 3 psi; and gas blowers or boosters with cast-iron housings for gas pressures from ½ to 6 lb. Technical data is included on agitation of liquids, air for combustion; pneumatic conveying. Lamson Corp.

DATA FILE of literature for the plant library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided on pages 35-36 and 185-186.

MECHANICAL POWER TRANSMISSION

201 Variable Speed Control Simplified—Bulletin 700 contains some 40 pp of descriptive, application and engineering data on variable speed pulleys and selective speed transmissions. Illustrations show how old and new machines can be equipped with efficient variable speed control. Lovejoy Flexible Coupling Co.

202 Improved V-Belts—This literature on company's Vulco rope drives explains how this rope with concave sides is designed to fill out to a precise fit in the sheave groove, to provide less wear, more pulley contact and more sure power when needed. The Gates Rubber Co.

203 Power Drive Handbook—Catalog 709, describing roller chains and sprockets, includes tips on selecting stock roller chains for every type of power drive service. Diamond Chain Co., Inc.

204 Sprockets, Roller Chain—Bulletin A-624, 24 pp, is compiled to provide plant engineers with all data required for selecting and ordering roller chain and sprockets. A page devoted to Taper-Lock sprockets for each size of chain from 40 to 100, giving sectional drawing, dimensions, number of teeth, maximum stock bore available, weights, prices and other data. Another page covers Taper Lock bushings; and full information is given on riveted and cottertype roller chains. Dodge Mfg. Corp.

205 Transmission, Conveying Equipment—Bulletin 53-110, 56 pp, is described as an abbreviated catalog on cast and steel chains, cast tooth sprockets, belt conveyor idlers and spray nozzles. It presents the story of corrosion- and abrasion-resistant Rex-Z-Metal, gives chain listings and prices and sprocket information. Take-ups, buckets, idlers, spray nozzles and chain attachments are also listed. A pictorial index is included. Chain Belt Co.

206 Coupling or Converter—To promote a better understanding of hydraulic couplings and torque converters, this 32-pp publication tells where couplings or torque converters should be used, and why, furnishing a source of facts on non-technical terminology. Covers meaning and characteristics of torque and effect on driving and driven equipment. Twin Disc Clutch Co.

207 Chart on Belt Care—In the interest of conserving power transmission belting, this manufacturer offers a cardboard wall chart on the care and maintenance of power driven belts. Carries sketches and brief text covering the steps to be taken to select the right belt, install it, use it correctly and keep it in good operating condition. Cling-Surface Co.

208 Belts to Suit the Job—This bulletin presents company's "inner-locked" woven duck belting available in types for general elevating and conveying and general power transmission applications as well as special jobs. Imperial Belting Co.

209 Oilless Bearings for Conveyors—Technical Catalog 210, 20 pp, gives detailed information for specifying, installing and use of bearings for screw and roller conveyors, together with operating characteristics. The sectionalized catalog provides tabular data and dimensional drawings to facilitate identification of bearings for replacement. Arguto Oilless Bearing Co.

VALVES, TRAPS, PIPING AND ACCESSORIES

210 Valves and Fittings—Illustrated Catalog 47 provides over 60-pp of ordering information and application data on valves and fittings made of stainless steel and other corrosion resistant alloys designed for use where corrosion or contamination are factors. Gate, globe, and angle valves for a wide range of services are presented, also needle valves, sampling

DATA FILE

(Begins on page 187)

valves, screwed and flanged fittings. Design and construction details are shown. Also included is a chart of first and second recommendations of alloys for corrosive media. Alloy Steel Products Co., Inc.

211 For Quick Valve Selection—Here's a 20-pp catalog digest providing ordering and application information on gate, globe, angle and check valves in bronze, iron, cast and forged steel construction, also valve accessories and parts. Illustrated and thumb-indexed, includes pressure-temperature chart. The Ohio Injector Co.

212 Valves for Processing—General Catalog 1500 B, 20 pp, describes in detail the operation and performance of all of company's single seated valves—the Domotor, electro-pneumatic, handwheel and combination models. Optional assemblies for specialized applications are shown. Application information, operating characteristics given. The Annin Co.

213 Efficient Flow Control—Data on bronze, iron, steel and corrosion-resisting valves in a wide range of types, for oil, water, gas and low pressure steam. Shows how valves are designed for service, low maintenance. The Wm. Powell Co.

214 Automatic Valves—Pressure, flow, and liquid level controls for steam, air, gas and fluids are shown in 90-pp Catalog A-50. Includes sizes, prices, capacity charts, conversion tables. Davis Regulator Co.

215 Reducing Valve Engineering Data—Bulletin 962 explains how the contour of a pressure reducing valve contributes to efficiency of performance. Discusses straight-line flow, tight closing. A. W. Cash Co.

216 Bronze Valves—Globe and angle bronze valves with rising stems, union bonnets and stainless steel plug type seats and discs are described in this bulletin. Discusses design advantages, gives dimensions and specifications. Walworth Co.

217 Steam Trap Reference Manual—Bulletin T-1740, 24 pp, tells why and where steam traps should be used; explains desirable trap features. Advantages of company's impulse steam traps are described, their operation illustrated. How to figure trap sizes and how to size condensate return lines are told and capacity and pipe dimension charts and thermodynamic properties of saturated steam included. Yarnall-Waring Co.

218 Steam Trap Book—Catalog J, 44 pp, includes physical data and prices on cast semi-steel and forged steel inverted bucket steam traps, compound steam traps and ball float air and air relief traps; a handbook section explaining how to calculate condensate loads and select traps for all classes of equipment; a maintenance section. Armstrong Machine Works.

219 Steam, Air and Gasoline Traps—Catalog 751, 32 pp, is a recently issued trap ordering book with capacity tables, installation diagrams, and containing charts and formulas for determining proper size trap for specific applications. Covers thermostatic steam traps, expansion steam traps, weight-operated traps for steam, air, gasoline, pressures up to 1500 lb; separators. W. H. Nicholson & Co.

220 Solving Steam Trap Problems—This popular 36-pp catalog on steam traps contains specifications and capacities on steam traps, float traps, air release valves and pipe line strainers. Tells how to calculate condensation loads and select traps for all classes of equipment, including unit heaters, jacketed kettles, autoclaves, submerged surfaces, steam mains and header drips. Gives pointers on how to install traps and service them. The V. D. Anderson Co.

221 Steel Unions—This catalog sheet describes and pictures several types of steel unions, telling applications of each and listing sizes, prices. Clayton Mark & Co.

222 Steam Hook-ups—This 64-pp manual on hook-ups for steam traps, air vents and temperature controls provides diagrams, size calculators, selection data on traps and regulators, properties of saturated steam, dimensions. Sarco Co., Inc.

223 Design Properties of Pipe—This 12-pp booklet consists of tables listing pipe sizes and wall thicknesses currently established as standard, plus what is believed to be the most nearly complete tabulation ever published of dimensional properties of commercial steel pipe. Tube Turns, Inc.

224 Handbook on Fittings, Flanges—Catalog wf-1950, 68 pp, offers working information on seamless carbon steel welding fittings and forged steel flanges. Includes dimensional tolerances, thread standards and threading practice; service pressure ratings, physical and chemical requirements. Grinnell Co., Inc.

225 Packless Expansion Joints—Bulletin 35-51A offers 28 pp of up-to-date information on company's Corruflex joints, their design and installation and advantages over other means of providing for thermal expansion in pipelines. Construction features are explained and illustrated; simplified selection data include tables for determining amount of expansion in pipelines. American District Steam Co., Inc.

226 Piping Pointers—This is company's popular piping manual covering fundamentals of sound piping practices. Discusses various types of valve designs and how each should be used. Pictures and names more than 80 kinds of fittings and contains many illustrated how-to-do-it features. Included with the manual is an 8-pp valve selection guide. Crane Co.

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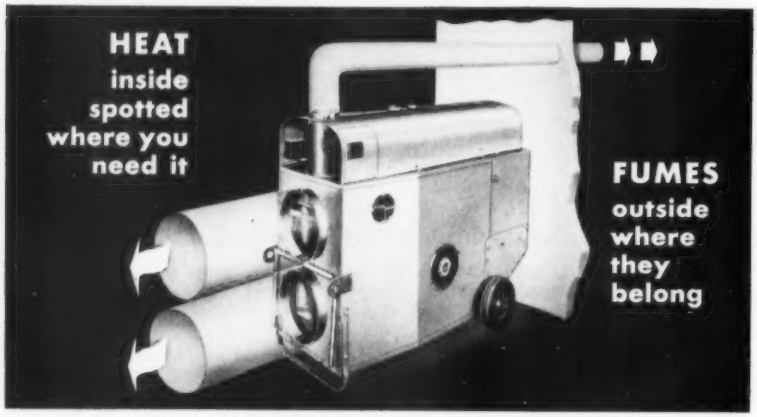

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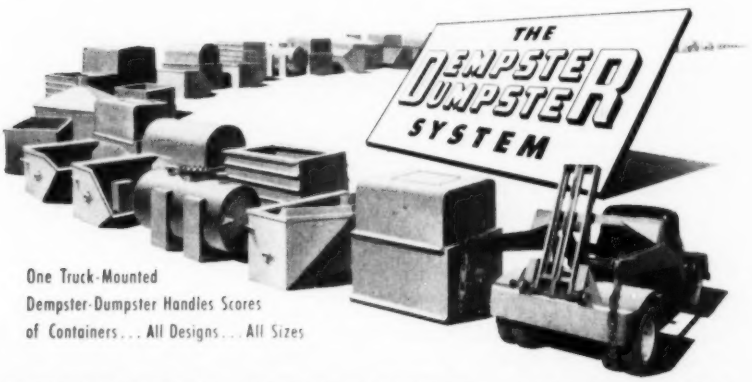

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DATA FILE

(Begins on page 187)

227 To Stop Those Leaks—Catalog 41-0 offers 28 pp of helpful ordering and application data on pipe repair clamps and saddles, valve and bibb reseaters. Illustrates each product, tells where to use it and how to install it, giving dimensions and prices. M. B. Skinner Co.

LUBRICANTS, LUBRICATION

228 Lubricant Data Book—This pocket-size 56-pp booklet gives product information and principal uses of approximately 40 lubricants of both grease and fluid types, and general directions for proper application. Discusses lubricants requirements of equipment in 25 major industries. Lubriplate Div., Fiske Bros. Refining Co.

229 Versatile Industrial Oil—Described in 20-pp Form AD 4078 is an all-purpose oil offering protection for a wide range of industrial equipment, and available in 15 viscosity grades. Discusses six major characteristics of the oil; explains and pictures its use in hydraulic systems, speed reducers, air compressors, electric motors, hydraulic turbines, bearing systems, etc. A chart shows grades and uses, physical properties. Standard Oil Co. (Ind.)

230 Cooperative Technical Consultation Service—This 24-pp booklet presents company's periodic consultation service offered to industrial plants and aimed at efficient use of petroleum products. Covers services available in solution of lubrication problems, metalworking operations, processing, fuel and heating oils, dust control. Gulf Oil Corp., Gulf Refining Co.

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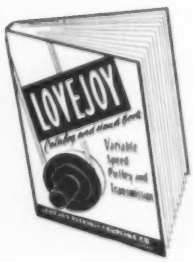

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231 Multi-Purpose Grease—This bulletin describes Gargoyle Grease BRB No. 1, intended to provide correct lubrication for practically all normally loaded anti-friction and plain bearings. Tells how it resists leakage, protects against rust and corrosion. Socony-Vacuum Oil Co.

232 High Temp Lubrication—How "dag" colloidal graphite has been used successfully in various lubricating applications involving temperatures up to and over 2000 F is described in Bulletin 423. Acheson Colloids Co.

233 Force Feed Lubricators—Twelve-pp Catalog 25 G describes and pictures company's new Model 25 lubricator, a popular priced, general purpose unit adaptable to many applications. Lists machines for which it provides economical, automatic lubrication. Discusses drive arrangements available, gives specifications, sizes. Manzel Div., Frontier Industries, Inc.

MAINTENANCE

234 Basic Roofing Information—"What You Should Know About Your Roof" is a 40-pp, clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses recommended roofing practices, essentials of a good re-roofing job, also special features of company's roofing materials. Johns-Manville.

235 Maintenance Manual—"Over the Rough Spots" is a 48-pp pocket size booklet giving the answer to practically every repair or building maintenance problem. Tells how to patch holes and resurface floors, how to prevent water seepage in underground foundations, repair leaky roofs, preserve concrete or wood surfaces, protect structural steel from rusting, and gives many time and labor saving methods. Generously illustrated. Stonhard Co.

236 Tar Base Coatings—Now available is a collection of five bulletins on company's 100 series of cold applied tar base coatings. One bulletin gives general information on the full line and provides an application chart. The others give detailed specifications and application information on the various types. These include a coating for protection against severest corrosive conditions; a thin high gloss coating for general maintenance purposes; a coating for protection against generally severe corrosive conditions; and one for water tank interiors. Pittsburgh Coke & Chemical Co.

237 One-Coat Insulation — This 32-pp booklet describes company's Type D insulation, a sprayed-on coating for surfaces with temperature range from —40 to 300 F. Tells how one application of this coating not only insulates but also waterproofs, rustproofs, deadens sound, prevents condensation and resists fire. Tells how to apply. Insul-Mastic Corp. of America.

238 Protective Paints—Details on a rubber-base paint formulated to afford increased protection against corrosion from acids and alkalis, and especially applicable for use on concrete, are provided in this literature. These finishes are also suggested for use on wood, metal surfaces. Cellulose Products Dept., Hercules Powder Co.

239 Building Maintenance—Handbook 7 offers 64 pp of information on floor surfacings, leak stoppers, external wall sealants, road patching, roofing materials. Includes instructions for use. Flexrock Co.

240 Iron Cement Handbook — This is a 40-pp pocket-size catalog of iron cements for repair, other uses. Tells how to mix and apply them. Gives illustrated instructions for dozens of repair and maintenance jobs. Smooth-On Mfg. Co.

241 Proper Care of Floors—Filled with what-to-use and how-to-use-it information, this 32-pp booklet is a well-written, practical text on floors. Presents floor preservation as a triple process involving cleaning, sealing and maintaining. Discusses various floor surfaces and their special problems. Gives helpful hints on floor maintenance and provides a handy

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DATA FILE

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chart covering preparation procedures and products for 12 common floor surfaces including cement, work, tile, linoleum, mastic wood. West Disinfecting Co.

242 For the Overhead Jobs—Scaffolds designed to make overhead work safer and easier are described in 16-pp Form 10-852. Illustrates and discusses adjustability, large working platform, easy assembly, self-locking trusses and other advantages. Shows how they are readily stacked for height. Baker-Roos, Inc.

243 Vacuum of Many Jobs—Bulletin 144, 20 pp. describes and illustrates 132 unusual industrial uses for company's vacuum system. The Spencer Turbine Co.

244 Floor Scarifier—Bulletin 83.4 describes and pictures a new hydraulically equipped machine designed for removal of traffic-packed grimes from trucking aisles in industrial plants. Explains how it cuts, picks up grime in one operation; is one-man operated. G. H. Tennant Co.

SAFETY, SANITATION

245 Dry Chemical Extinguishers—New quick-acting fire extinguishers of the dry chemical type in 20 and 30 lb sizes are covered in Form C-104. C-O-TWO Fire Equipment Co.

246 Advice on Washrooms—Information on company's washroom advisory service is available to plant engineers. Tells of plans and specific suggestions for improving washrooms which are included in this service. Scott Paper Co.

247 Hand Dryer—Form 1123 describes and pictures a high-speed hand and face dryer for use in industrial washrooms. Tells special features, gives specifications. The Chicago Hardware Foundry Co.

CONSTRUCTION

248 Glass Block Fenestration—The natural ventilation characteristics of glass block fenestration are presented in this illustrated report of a test project. In some 88 pages, report covers sun hoods, window types, dual outlets, air speeds, double loaded variations, reverse draft and ventilation below window sill. Test data is summarized and recommendations included. Although test was conducted on glass block fenestration in school buildings, the information will be of interest to those concerned with industrial applications of glass block. Kimble Glass Co.

249 Heat Absorbing Glass—This 16-pp catalog describes Coolite, a glass designed to trap and absorb much of the sun's heat and to filter out annoying glare. Discusses types and thicknesses, gives light transmission data. Pictures many industrial installations and shows how conditioned natural illumination helps reduce operating and maintenance costs. Mississippi Glass Co.

250 How to Glaze with Plexiglas—Sixteen-pp Booklet PL-23 gives detailed information on glazing industrial and other buildings with flat panels of the acrylic plastic Plexiglas. Written for plant engineers concerned with frequent breakage of windows or other glazing problems. Gives properties and behavior of this plastic sheet. Plastic Dept., Rohm & Haas Co.

251 Sandwich Panel Insulation—This folders discusses the use and advantages of Foamglas in sandwich panel construction. Tells outstanding properties of Foamglas and includes illustrated examples of its use. Pittsburgh Corning Corp.

252 Technical Manual on Plywood—Available basic data on Douglas fir plywood, its properties and use, are offered in looseleaf sections with firm binder. Presents engineering information about this panel material and its performance

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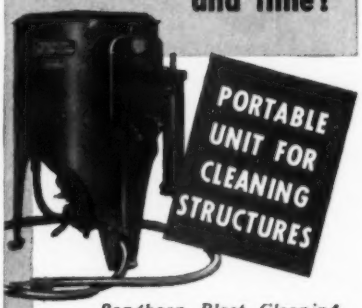

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Calibrated control point setting dial, proportional band and sensitivity adjustments, manual-automatic switch . . . are all readily accessible when the door is opened.

specifications

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DATA FILE

(Begins on page 187)

in varying applications. Covers commercial standards, designing with plywood, prevention of condensation, lateral bearing strength of nailed plywood joints, deflection. Please give your title when requesting this book. Douglas Fir Plywood Assn

253 How Hardboards Improve Methods—Twelve-pp Form 5202, on production economies in plant maintenance, materials handling and processing, enumerates applications and specifies types and thicknesses of company's Presdwood for specific purposes. Lists 28 advantages of Presdwood, describes its use in architectural applications, bins, utility boards, cabinetwork, containers, booths and ventilators, work surfaces. Masonite Corp.

254 Metal Framing Guide—Although pocket-sized, 80-pp Catalog 800 is packed with illustrated information on an all-purpose metal framing system, and serves as a handy reference text. Fully indexed, shows the versatile basic channel, suggests possible combinations and pictures typical fittings and parts. Provides design and application data and pictures some of the almost unlimited uses for this framing system. Includes reference tables. Available to qualified plant engineers. Unistrut Products Co.

255 Where to Use Your Stud Driver—Twenty-pp pocket-size Form 955 describes and pictures applications of studs, using company's Model 450 stud driver. Provides some operating hints and safety precautions and covers use of studs through steel into concrete, wood into concrete, wood into steel and steel into steel, as well as their use for attachment of predrilled fixtures. Remington Arms Co., Inc.

TOOLS, WELDING AND MACHINE SHOP EQUIPMENT

256 Pipe Tool Book—This catalog and data book gives information on pipe and bolt machines, power units, rachet threaders, reamers and cutters, other power and hand tools. Includes popular "operating guide" section, fully illustrated with easy-to-grasp drawings. Beaver Pipe Tools, Inc.

257 Portable Spray Gun—An easily used and inexpensive spray gun pressurized with a CO_2 cartridge is featured in this single sheet bulletin. Sketches show the gun in use for painting, cleaning, other work. Sullivan-Becker Machine Co.

258 For Faster Fastening—Form 35-A explains and illustrates company's system of fastening tools and fasteners for use with steel, wood, concrete, fabricated hard materials. Ramset Fastening System, Inc.

259 Hydraulic Pullers—Industrial maintenance problems involving removal and installation of gears, bearings, pulleys, sheaves, pinions, shafts, couplings, and tubes are treated in Power-Twin Bulletin HY-1953, 24 pp. Covers use and application of pullers, attachments and adaptors for 17½-, 30- and 50-t hydraulic rams. Also shows puller sets for use with company's center-hole rams. Owatonna Tool Co.

260 Resistance Welding—Featured in this 24-pp catalog are newly-designed tips and holders recently added to company's equipment. Full information is also given about other holders, tips, seam welder wheels and shafts, and bushings, in manufacturer's line, as well as flash, butt, barrel and projection welding dies. Ampco Metal, Inc.

261 Automatic Deburring—This bulletin stresses the economy and efficiency of mechanical deburring with manufacturer's brushing machine. Two illustrated case histories show how the mechanical method cuts production costs. The Osborn Mfg. Co.

262 Improved Cutting Oils—Cutting oils for keeping parts and tools up to 50 deg cooler and representing a new concept in

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PRECISION machinery, displays and other fragile cargoes are far more likely to arrive undamaged when you use light, strong fir plywood shipping cases. Fir plywood is tough. Cross-lamination makes it split-proof, puncture-proof. Rigid plate-like action keeps containers from racking or twisting out of shape.

Fir plywood shipping cases help cut costs, too. They can be re-used many times. Light weight lowers shipping costs, speeds handling. Fir plywood cases are easier to build, require less framing. For packaging catalog or other data, write Douglas Fir Plywood Association, Tacoma 2, Washington.

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Fir plywood is made in two types: **1.** *Interior-type* for indoor or structural uses; **2.** *Exterior-type* for uses exposed to water or weather; EXT-DFPA on panel edge means 100% waterproof glue. Grades within each type meet exact use-needs.

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INTERIOR FIR PLYWOOD PLYSCORD DFPA INSPECTED

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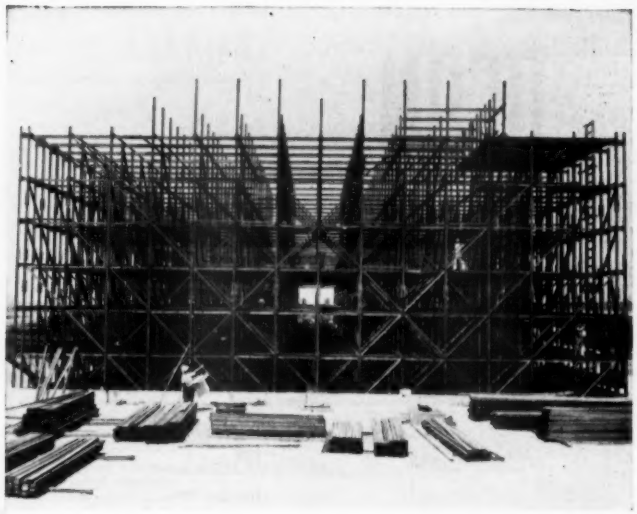

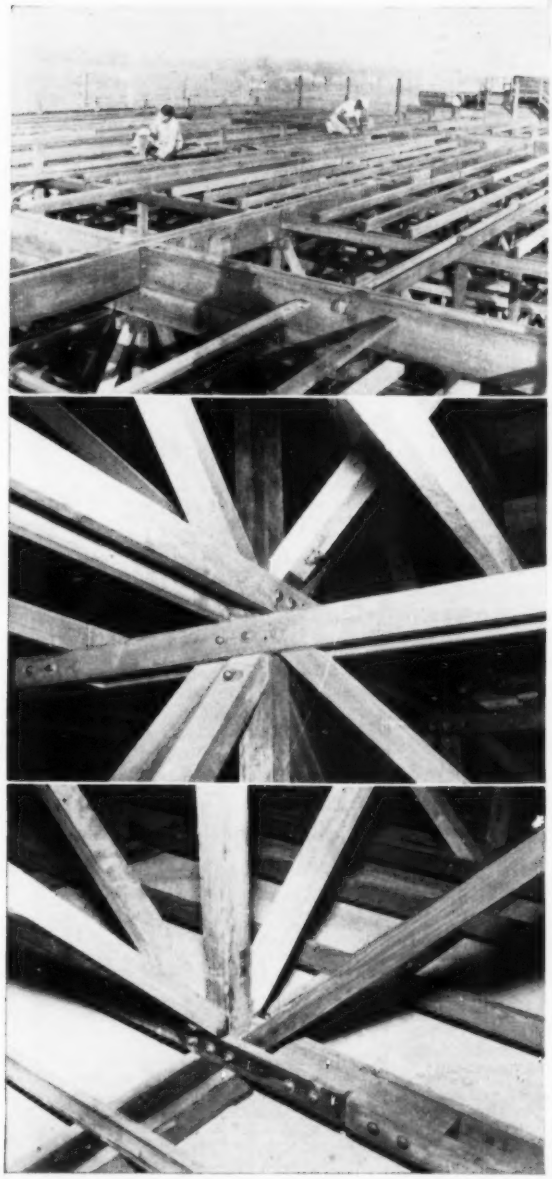

For 25 years, Marley has put primary emphasis on structural engineering. Present excellent condition of many early Marley cooling towers attests the success of this policy.

Marley towers were the first to be constructed to withstand 100 mph wind load. Marley design today incorporates many exclusive features that mean added strength . . . longer service life. Typical is the Marley method of bracing each wall against external forces by diagonal members carrying horizontal forces directly to the foundation. Maximum rigidity is obtained by independently bracing each wall with diagonals only in compression.

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Marley engineering combines structural elements to produce an unusually strong rigid fan deck—one that easily accepts any load imposed by operation and maintenance. Support members on very close centers, the heavy timber foundation for mechanical equipment and tower bracing diagonals all join in supporting the heavy tongue and grooved flooring, making a perfectly integrated structure.

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This distinctive Marley structural joint is made without notching any members. Diagonal joints bear in compression (wood on wood) eliminating castings and plates subject to corrosion. All horizontal members are ruggedly supported by heavy timber ring connectors at this point.

INTERIOR BASE JOINT

At this important joint vertical, horizontal and diagonal members are joined. Diagonal bracing is framed to the base of column to avoid bending stresses and all columns are held in perfect alignment by interconnection with horizontal members in two directions. Here accumulated load is transferred to the foundation by this carefully engineered system of horizontal members and base anchorage.

The Marley Company

Kansas City, Missouri

MARLEY

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DATA FILE

(Begins on page 187)

non-emulsifying oils are described in two new technical bulletins. Form A-2724 describes Sunicut 11-S and 209-S, non-staining dual-purpose oils primarily for medium duty and heavy duty operation on automatic screw machines. Form A-2723 covers Sunicut 102-S and 110-S, which contain active-type sulfur and are effective for heavy-duty operations. Sun Oil Co.

263 Data on Welding Rods—Data sheets 179, 211, 219 and 220 give properties, typical applications, corrosion resistance, and recommendations for grinding wheels and welding procedure covering four types of Rexweld hard surfacing welding rods for gas and arc welding. Crucible Steel Co. of America.

MAGNETIC EQUIPMENT

264 Magnets in Stock—A complete listing of stocked sizes and shapes of Carboloy Alnico permanent magnets is provided in 20-pp Bulletin PM-100. Contains pull curve and size information in tabular form on both cast and sintered types, as well as sizes and application data on holding assemblies, including sheet steel separators, magnetic retrievers and stands. A list of available patterns for various sizes of cast Alnico bars, etc. is included. Carboloy Dept., General Electric Co.

You may use the two Reader Service Cards to request information on ads, too. Just circle the key number appearing at bottom of the ad.

265 Magnetic Pipeline Traps—Bulletin B-203 describes magnetic pipeline traps for sanitary and standard applications. These permanent (non-electric) traps are designed to remove tramp iron from liquid flow lines and afford protection to processing equipment. Typical trap installation data given. Eriez Mfg. Co.

266 Magnetic Selection Guide—Twelve-pp illustrated Catalog C-5000-B, describing manufacturer's entire line of magnetic separators and lighting magnets, serves as handy guide to the selection of magnets. Dings Magnetic Separator Co.

ELECTRICAL

267 Motor-Generator Reference Book—Publication 51R7933 is a 50-pp booklet compiled to assist in the selection of motive power to handle most industrial applications. Neither text book nor ordering catalog, this book provides a brief outline of the various types of motors, generators and motor-generator sets, telling their applications and operating requirements. Booklet is generously illustrated and includes performance data, ratings, information on methods of speed control, general characteristics. Allis-Chalmers Mfg. Co.

268 Industrial Motors—Twelve-pp Brochure 100 gives information on company's line of industrial motors. Construction details are discussed and drip-proof, splashproof, totally enclosed and other types described and illustrated. Mechanical and electrical modifications possible are detailed and selection data included. Motor generator sets, brake motors, elevator hoist motors are shown. Electro Dynamics Div., General Dynamics Corp.

269 Motor Controls—In this 28-pp bulletin the most important items in company's line of standard motor control apparatus for all industries are presented. Controls, starters and accessories are described and applications listed. Allen-Bradley Co.

270 Variable Speed Motors—Sixteen-pp Bulletin 1797, revised, outlines many rea-

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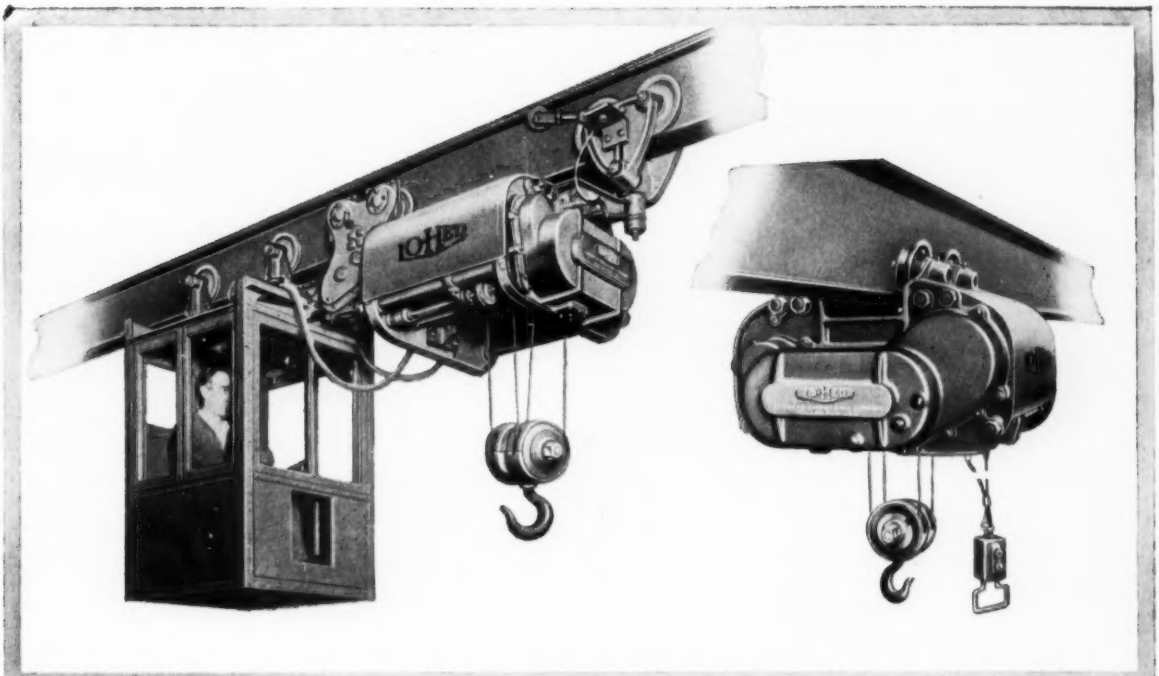

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Whatever your belting needs, an Imperial Belt, job-designed for your specific operating conditions, will cut your handling costs. Write for Data Sheet 51-9 and prices.

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Imperial BELTING CO.

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Engineered Belting —The Right Belt for Each Job

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DATA FILE

(Begins on page 187)

sons why variable speed motors can be used to improve production, and it includes illustrations of all types of company's Varidrive motors, as well as their mechanical features, remote controls, etc. U. S. Electrical Motors Inc.

271 Motor Panorama—Motors and generators—about 50 types in all—are pictured in Publication AEB 100.8B, which serves as a handy reference, since it lists specific literature dealing with each motor shown. Gives general construction details of each unit. Fairbanks, Morse & Co.

272 Motor Handbook — Bulletin MU-185 provides 66 pp of engineering and descriptive data on motors, covering splash-proof and explosion-proof types, gear motors, motors for use in chemical plants, for oil well pumping, punch presses, elevators, cranes and hoists. Waggner Electric Corp.

273 The Answers on Wiring—"20 Questions and 20 Answers on Safety m.i. Wiring" describes and illustrates characteristics and advantages of this new wiring system. A complete table of types, sizes, weights and lengths, as well as a partial list of users included. General Cable Corp.

274 Bus Duct Manual—Booklet B-4272A, 68 pp, on bus duct and accessories, presents application and test data, specifications, information on pricing a typical installation. Describes advantages of bus duct or a secondary power distribution system, carrying current from transformers to switchgear—and from there to motors, etc. Westinghouse Electric Corp.

275 Plug-In Power—Sixty-pp Catalog 25 offers real help on electrical installation problems involving portable tools, materials handling equipment, cranes, hoists, cutting equipment. Covers a prefabricated trolley busway electrical distribution system to provide outlets for power or light where needed. Feedrail Corp.

276 Power Distribution Feeders—Catalog TEB-1, 40 pp, on heavy-duty units for main feeders in distribution system, gives construction, engineering, application data. Trumbull Dept., General Electric Co.

277 Power and Control Cables—Sixty-pp Catalog 24 describes typical power and control cable designs and is intended as a guide in selecting proper wire and cable type. Describes insulations, sheaths and coverings, electrostatic shielding, and includes product data on all types listed. Rome Cable Corp.

278 FHP Manual Starters—Bulletin 224 is a folder giving the features and ratings of a line of fractional horsepower manual. Lists applications for these starters and pictures enclosures. Square D Co.

279 Power Distribution Practices—The 28-pp "Industrial Power Distribution Idea Book" (Bulletin GEA-5900) is a guide for plant engineers on electric power distribution practices in large and small plants. Covers utility distribution practices; methods of buying power; what to do when a choice of primary voltages is available; application of primary switches and circuit breakers; types and arrangements of primary cables; and types of load-center distribution systems. Also discusses branch feeder switches, starters, and fuses, grounding of systems, interrupting capacity. General Electric Co.

280 Small Bus Duct—Detailed information on a midget-size bus duct is contained in Bulletin 703. Illustrates entire unit, also trap and hanger. Text discusses major parts, design features. Includes list prices. Frank Adam Electric Co.

281 Battery Technology Handbook—This is a 56-pp revised edition of company's manual of technical instruction and engineering data on the care of motive power storage batteries. Major addition is a sec-

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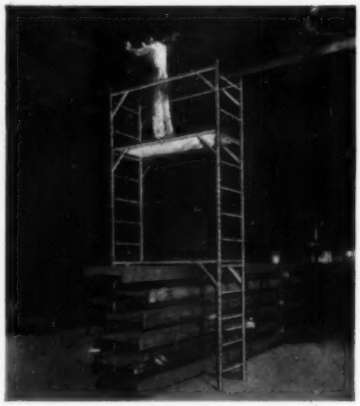

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SAFETY FEATURES:

- **Large Platform Area**
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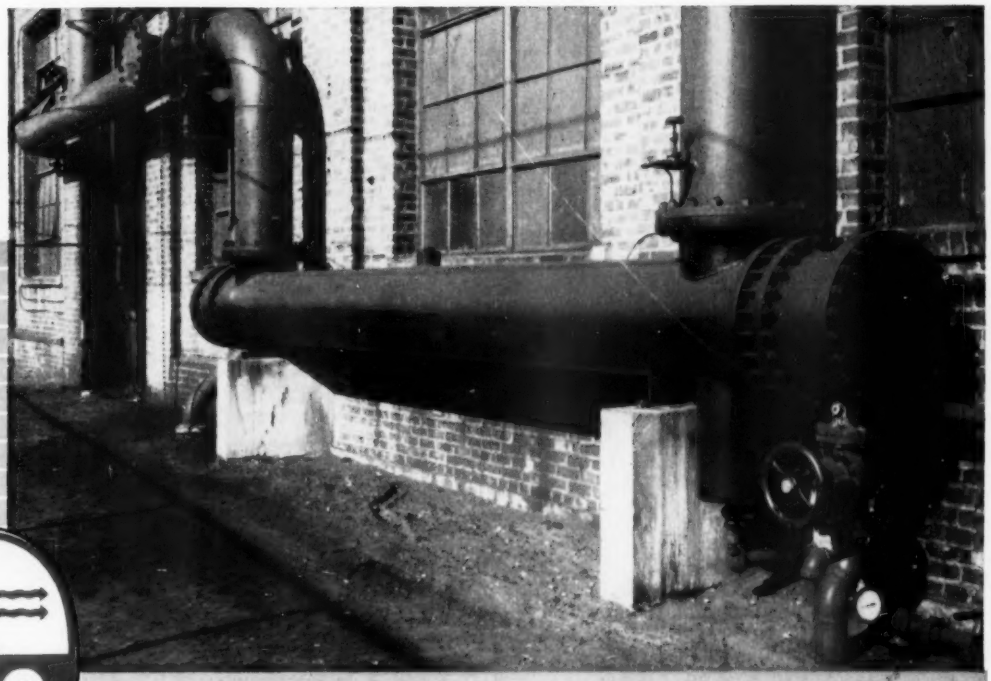

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Whether you require equipment of standard design or specially engineered units, B & G *Hydro-Flo* Heat Exchangers will stand up under any measurement of value you can apply. They are the sum of both practical field experience and continuous laboratory research and development.

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B&G Hydro-Flo shell-and-tube heat exchangers are available in the following types:

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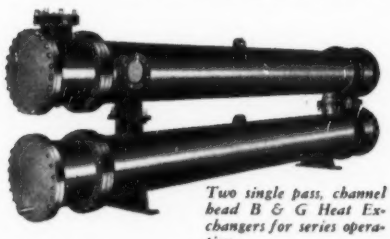

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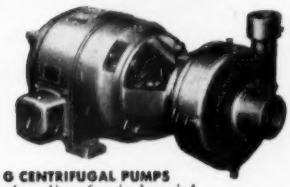

B & G CENTRIFUGAL PUMPS
A complete line for industrial application and refrigeration or air conditioning installations. Send for catalogs.

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DATA FILE

(Begins on page 187)

tion on charging, which includes information on modified constant voltage and two-rate charging, boost, equalizing and emerging charging, control of discharge, etc. Other sections cover the theory of the lead-acid battery; practical tips on care and operation; maintenance and repair. Gould-National Batteries, Inc.

282 Preventive Maintenance Tips—Booklet B-5477, 28 pp, discusses programs designed to reduce shut-down time on production lines and treats in detail the maintenance of power equipment. A suggested schedule of work and cleaning on power equipment is presented in chart form. Essential information on preventive maintenance for turbines, generators, switchboards, motors and controls is given. Westinghouse Electric Corp.

283 Circuit Breaker Reference Data — Catalog Section 5000 is a collection of more than 30 data sheets providing selection and application information and ordering instructions for company's molded case circuit breakers. Fully illustrated, includes ratings, current carrying capacities, dimensions, prices. I-T-E Circuit Breaker Co.

284 What You Should Know About Circuit Breakers—Sixteen-pp Manual 101 explains operating principles of basic circuit breaker designs and provides engineering data on factors of application. Includes simplified diagrams of three basic types. Illustrates with colored charts and diagrams, explains temperature factors, inrush current effects, tripping and reset time. Heinemann Electric Co.

285 Power Circuit Transformers — By means of comparative wiring diagrams, 12-pp Bulletin 501-15 demonstrates the economy and system simplicity afforded through the use of company's power circuit transformers in handling lighting, and low voltage feature of these dry type transformers, their use in converting old installations, isolating service. Jefferson Electric Co.

286 Snap Action Switches — Catalog 82, 23 pp, on precision snap-action switches, presents safety, limit, and interlock types designed especially for switching a-c circuits in industrial applications. Covers heavy-duty limit switches, metal enclosed switches, some of which are sealed against dirt, dust, splashing. Micro Div., Minneapolis-Honeywell Regulator Co.

287 Electrical Equipment for Cranes—A complete line of electrical equipment designed exclusively for crane service is presented in 32-pp Bulletin C5-1. Covers everything from company's a-c Magnetorque crane control to current collectors, and is generously illustrated. Overhead Crane Div., Harnischfeger Corp.

288 Flexible Cords—This well-illustrated 24-pp booklet includes all new Underwriters' classifications for flexible cords manufactured by this company. Featuring data on Dynaprene and rubber jacketed cords as well as braid covered types, also gives tips on how to select proper cord. Whitney Blake Co.

INSTRUMENTS, CONTROLS

289 Wide Range Regulator—Featured in Bulletin 316 is an expansion stem type temperature regulator operated by water or compressed air. Explains how regulator works. The Powers Regulator Co.

290 Gages for Many Jobs—Sixty-eight pp of liberally illustrated information is offered in Catalog 64. Describes a variety of gage types; air volume controls for pump installations, vapor tension thermometers, d-c ammeters and voltmeters, and water flow meters covered. Includes engineering tables. United States Gauge Div., American Machine and Metals, Inc.

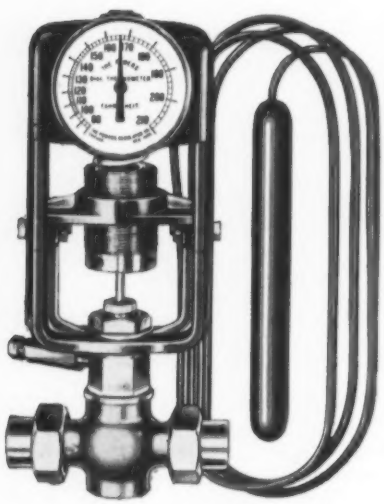
291 Handbook on Automatic Controls—Catalog 700 provides 45 pp of ordering and application data on automatic controls with mercury contact switches. Covers control equipment for temperature pressure-low water, liquid level, bottles; transformer-relays, valves. The Mercoid Corp.

"That was our first plant building."

292 Industrial Controls—Catalog 8305, 84 pp, describes and illustrates non-indicating electric, electronic and pneumatic controllers for temperature, pressure and humidity; also pneumatic and electric valves, switches and relays. Indexed and compiled for easy use, catalog provides specifications, dimension drawings, application data and ordering information. Industrial Div., Minneapolis-Honeywell Regulator Co.

293 Electrical Instruments—A line of instruments for production testing, plant maintenance and service is shown in 16-pp Bulletin A-16-B. Among these are a-c clamp volt ammeters and a-c clamp ammeters, circuit testers, analyzers, mutual conductance tubechecker, pocket-size meters. Weston Electrical Instrument Corp.

294 For Continuous Level Indication—A continuous level indicator, for liquids, granular solids, viscous fluids, powder, etc. is described in this 8-pp bulletin. Stresses features of the instrument and describes



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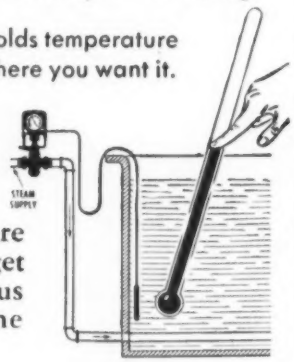

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Bulletin 330 describes this simple, dependable control. May we send you a copy? (b31)

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The critical problem of leakage in small valves used for metering, instrument lines, and sampling of corrosives has been solved by the new ALOYCO design features shown here: renewable Teflon seats and exterior threading completely out of the fluid zone.

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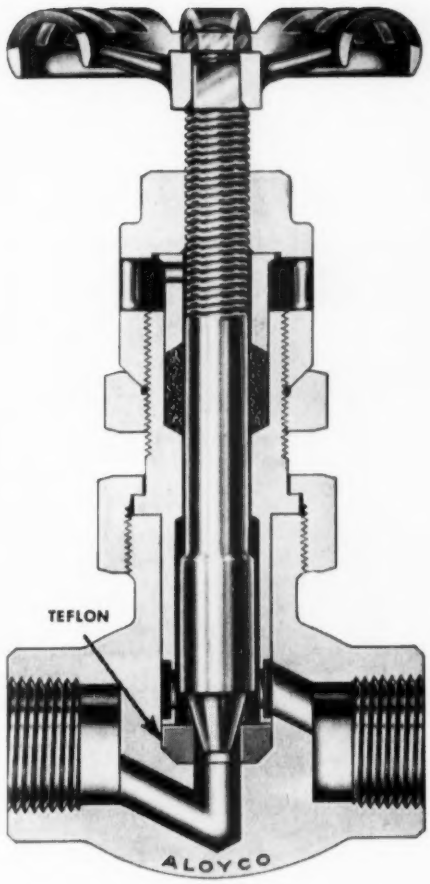
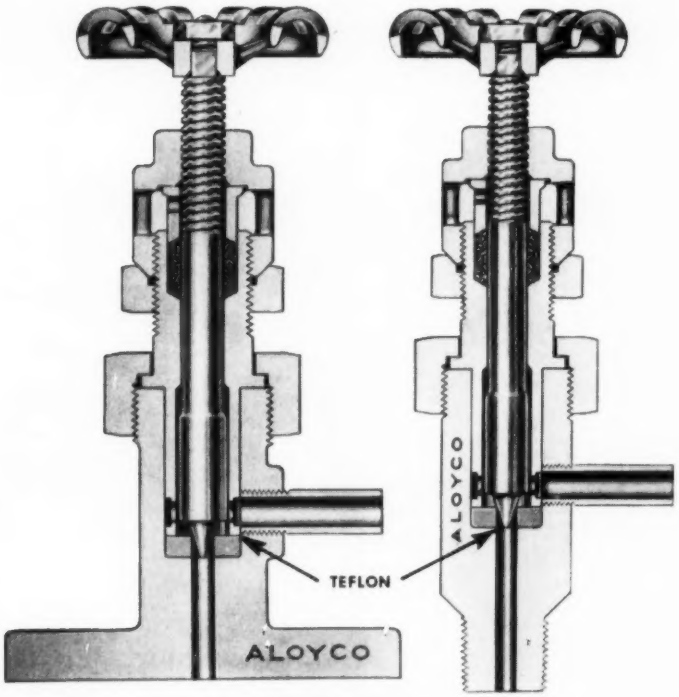


No. 62 Needle Valve, 3000 lb. working pressure, made in sizes ¼ inch through 1 inch. Available in 18-8S (type-304), 18-8SMo (type-316) and Aloyco 20.



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150 pound service

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Automatically prevents reverse flow through Compressor and also dampens pipe line pulsations.

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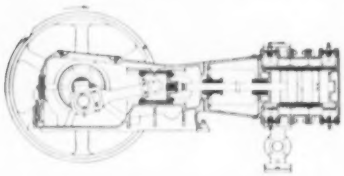

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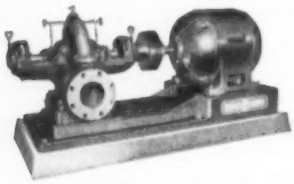

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DATA FILE

(Begins on page 187)

both electronic measuring unit and indicator. A typical installation is shown and operation is explained. Fielden Instrument Div., Robertshaw-Fulton Controls Co.

295 Orifice Meters—Bulletin 1050 Rev 1, 28 pp shows how manufacturer's orifice meters are made, how they operate. Tables give capacity data, and there are descriptions of manifold arrangements and differential ranges, along with illustrations of various parts. Sketches show how meters are used with liquid seal chambers and piping for steam, corrosive gases and liquids. Rockwell Mfg. Co.

MATERIALS HANDLING

296 Data on Tramrail Equipment—Twelve-pp Form 2008F is a well organized booklet on tramrail systems. Tells what an installation can do toward improving handling efficiency. Rail and arch design, switches, cranes and transfer bridges, carries, hoists, cranes, buckets, grabs are pictured. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

297 Engineered Monorail Applications—A file of application literature is announced as the beginning of a new service offered potential users of monorail equipment. Includes a technical booklet on automatic dispatch systems and an equipment bulletin in addition to several case studies of installations. As they are completed new groups of case studies will be sent to holders of file. Available to qualified plant engineers. The American MonoRail Co.

298 For Overhead Handling—This 12-pp illustrated catalog covers motorized and hand operated cranes and monorails engineered for efficient, low-cost handling. Special construction features are detailed; accessory equipment shown. Abell-Howe Co.

299 Materials Handling Equipment—Illustrated Catalog P602 is a 44-pp guidebook on materials handling equipment for industrial plants. Subjects covered include description and application data on company's gas and electric fork lift trucks, motorized hand trucks, hand lift trucks and hand and electric hoists. The Yale & Towne Mfg. Co.

300 Metal Conveyor Belts—This 24-pp booklet is an illustrated guide to selection of metal conveyor belts. Presents both conventional and balanced spiral weave belts; covers raised edge and flight constructions, chain edge construction, high temperature belts, wire conveyor aprons. Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp.

301 Tubular Conveyors—Form HC-541 contains about 44 pp of data on tubular conveyors for moving almost any flowable material. Shows basic types of these conveyors, tells what they're designed to do and how they are applied. Lists materials being handled to advantage with them, and discusses benefits. Gives engineering data. Hapman Conveyors, Inc.

302 Tubing for Many Jobs — Flexible tubing for ventilation, fume and dust removal as well as materials handling is described in 8-pp Catalog C2-4. Gives detailed information on company's Spiratube A and Spiratube R, two types of lightweight tubing made from continuous helical coils of spring wire wound with overlapping plies of fabric. Gives applications of both types. Flexible Tubing Corp.

303 How to Pick a Truck—Catalog 54, 8 pp, features a step-by-step procedure for making the best fork truck choice for a particular handling job. Other sections in the booklet show at a glance complete specifications on each of company's trucks. The Baker-Raulang Co.

304 Industrial Truck Reference Guide—Bulletin 300, 44 pp, covers company's line of current model tractors, trailers, fork lift trucks, platform lift trucks and load-carrying trucks. Major categories are: the trackless-train system; the fork-truck pallet system; and the lift truck-skid system. Each category is preceded by an analysis of applications and merits of the handling system. Mercury Mfg. Co.

305 Industrial Logistics—Form A-9516-4450 is a 12-pp booklet covering strategic handling of materials from raw state to distribution. Discusses master unit load and transportation cycle. Explains company's system of adapting all loads to four types of containers, assembling maximum numbers of these into master unit loads, and transporting them as single units. The Elwell-Parker Electric Co.

306 For "Floor Level" Handling—Junior Catalog 535 is the 100-pp eleventh edition of company's well known pocket-size catalog. Contains information, illustrations and specifications on fork trucks, high lift electric trucks, pallet trucks, industrial tractors, electric and hand lift trucks, steeleg skids and boxes, semi-live skids and lifters, portable elevators and cranes, stacking frames, storage racks, die tables, handling specialties. Barrett-Cravens Co.

307 Safe Truck Operation — "Safety Saves!" is a 24-pp booklet setting forth "do's" and "don'ts" established as a practical code of truck operation. The admonitions, pointed up by cartoons, serve as both "refresher course" and text. Industrial Truck Div., Clark Equipment Co.

308 How to Operate a Crane—Booklet 920 is a 48-pp generously illustrated instruction book on crane operation, helpful to both beginner and seasoned operator. It shows hand signals, defines crane and hoist terminology. Covering all phases of crane operation, it discusses in detail the co-ordination of crane motions and includes safety rules and inspection, maintenance tips. Individual copies of this book are free to qualified plant engineers. The Electric Controller & Mfg. Co.

309 Chain Hoists—Catalog 61, 32 pp, covers a line of chain hoists, telling how

RESEAT VALVES AND BIBBS
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RESEATING A VALVE
PAYS FOR ITSELF ON FIRST 2 OR 3 JOBS!
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Whatever and wherever spot loads must be lifted in a hurry, you can depend on the 'Budgit' Aluminum Chain Block for smooth lifting and lowering. Sizes range from ¼ to 2 tons. Ask your "Shaw-Box" Distributor for full details or write for Bulletin 398,

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DATA FILE

(Begins on page 187)

to select and use them. Provides an illustrated comparison chart of hoist types, a selector table and discussion of factors to be considered in buying a hoist. Multiple gear chain hoists, screw gear chain hoists, differential chain hoists described separately. Reading Crane & Hoist Corp.

310 Electric Hoist Manual—Catalog 215-B offers 38 pp of engineering, application and ordering information on company's Load Lifter electric hoists. Presents hoists with hand operated trolleys and with power travel, hoists with lug suspension, hook suspension and push-type trolleys, and with hand-geared trolleys, hoists for low head. Manning, Maxwell & Moore, Inc.

See pages 35-36 and 185-186 for postage-free mailing cards. Use them to ask for bulletins — just circle item numbers of all those wanted.

311 Locomotive Cranes — Catalog 84, 16 pp, stresses advantages of the torque control unit used in company's cranes, and features illustrations of the mechanism and converter unit. Describes in detail the sealed, anti-friction bearings, air controls, brake, limit switch and other components. Orton Crane & Shovel Co.

312 Manual on Electric Hoists—Catalog H-46, 4 pp, covers monorail and stationary hoists and car pullies. Explains fundamental types of grabs, methods of hanging I-beams, types of hoist suspension, controls. American Engineering Co.

313 Sheet Lifters—Operational and design features of company's sheet lifting equipment which contribute toward efficient handling, flexibility and economy are explained in Bulletin S-25, 16 pp. Cullen-Friestedt Co.

314 Shovel and Loader—Described in 12-pp Bulletin 1932 is a hydraulic crown and hoist shovel and loader incorporating mechanical features usually associated with big shovels. Illustrates, gives specifications, application information on both pneumatic traction and crawler traction models. Dempster Bros., Inc.

315 Trolley Hoists—Bulletin DH-269, 2 pp, describes and pictures ½ to 3 t capacity army-type trolley hoists, plain or geared, for use where a close headroom assembly is required. Gives dimensional and capacity data, prices. Wright Hoist Div., American Chain & Cable Co., Inc.

DUST CONTROL

316 Dust Control Brochure—Dust and fume control in many industries is the subject of this comprehensive 24-pp booklet. Tells how cloth-tube type dust collectors are handling complex problems in 33 typical installations, all illustrated. Covers use of these collectors in chemical processing, coal cleaning, sewage disposal, many other applications. American Wheelabrator & Equipment Corp.

317 Dust Control Technology—Detailed selection, operation and maintenance data are contained in this 50-pp digest-size book, "Industrial Dust Control Through Exhaust Systems." Treats exhaust hoods, piping systems, dust collecting equipment, exhausters and drives. Lists basic methods of dust control and analyzes elements of exhaust systems. Pangborn Corp.

318 Manual of Exhaust Hood Design—Bulletin 270-E1, 24 pp, features engineering data on dust control systems for the metal working industries. Illustrates and discusses the design of exhaust hoods for

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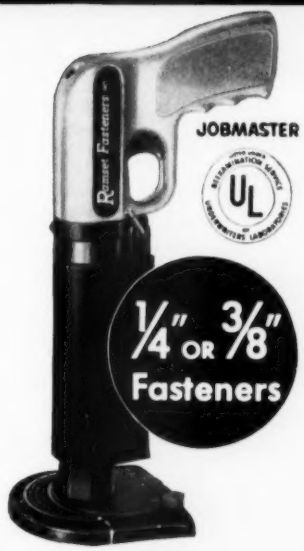

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WITH THE CENTER-HOLE OTC 50 TON HYDRAULIC PULLER

New 50 Ton CENTER-HOLE Hydraulic Puller

Removes or installs bearings, gears, pinions, shafts, studs, wheels, pulleys, etc. — 75% faster and 90% easier without damage or distortion. This new OTC 50 ton ram is completely portable (weighs only 45 lbs.) — has remote control pump — interchangeable ram heads — and can be used as a production holding fixture. Also available in 17½ and 30 ton sizes.

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Booklet describes complete line and uses of OTC tools.

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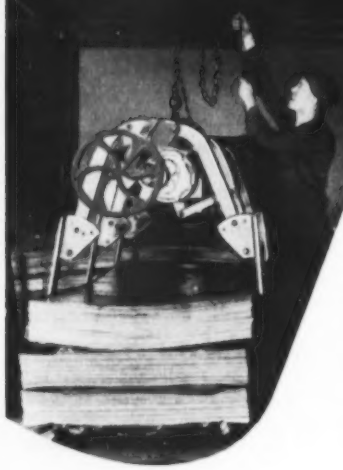
1 man . . . handles Sheet Steel Faster, Easier with a C-F LIFTER



C-F Lifters, under one man operation, pick up, carry and unload more sheet steel tonnage per hour than any other method – and at lower cost per ton. Wide carrying angles hold sheets securely – won't damage high grade sheets; tong action insures safe carrying; fast opening and closing adjustments of Lifter jaws permit shifting from one size pack to another in seconds. C-F Lifters are made in standard or semi-special models to handle from 2 to 60 tons.

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DATA FILE

(Begins on page 187)

many operations in this field. Also, 61 photos of dust control installations show various methods of hooding dust sources. American Air Filter Co., Inc.

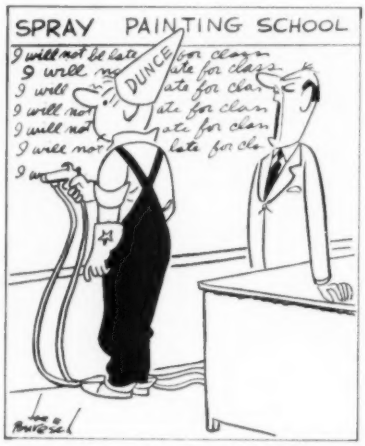
319 **Dust Control**—Bulletin 98 explains value of industrial dust control and principles of dust suppression, collection by filtration. Describes dust control equipment, providing specifications, dimensions on filters, systems, automatic controls. The W. W. Sly Mfg. Co.

320 **Dust Recovery** — "Engineered Efficiency in Dust Collection and Recovery," 36 pp, discusses industrial dust recovery from standpoints of nuisance abatement, waste avoidance, hazard elimination. Shows effect of variation in particle size distribution and specific gravity of dust on efficiency of the dust collecting system. Buell Engineering Co., Inc.

PUMPS, COMPRESSORS

321 **Installing a Pump**—Blaming many pump operating troubles on improper pump selection and installation, this 8-pp technical article tells what should be taken into consideration when ordering a pump. Titled, "Studying the Installation," it discusses head, viscosity, pipe friction, suction lifts, horsepower. Viking Pump Co.

322 **Pump Service Manual**—Bulletin 202 is a 20-pp booklet covering installation, operation and maintenance of manufacturer's reciprocating pumps and providing helpful engineering information. Suction piping, valves and accessories for proper operation are discussed. Sectional drawings and parts lists are provided, also high and low capacity stream consumption curves, general information on water, properties of steam. Warren Steam Pump Co., Inc.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DUNCE

"Spray it on the board 100 times."

323 **How to Solve Pumping Problems**—A new printing of this popular 36-pp booklet makes it again available to plant engineers. Filled with helpful technical information, explains design and operation of rotary gear pumps and discusses factors of pumping problems, covering some sample ones in detail. Illustrated, provides friction loss and conversion tables, electrical data, viscosities of liquids, construction materials for handling various liquids, resistance of valves and fittings to flow of fluids. Geo. D. Roper Corp.

324 **For Abusive Pumping Jobs**—Catalog 4906, 36-pp, covers centrifugal pumps for wide industrial use and especially adapted to handling ashes, abrasive mixtures, slurries, hot and corrosive liquids. It describes several basic types; a horizontal shaft, single-stage side suction pump; a hori-

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Fabri-Valves are an all around saving. They are lower in original cost, easily maintained, weigh less, are cheaper to ship and install. 2-in. to 24-in. Fabri-Valves carried in stock . . . custom-made orders filled in 30 days. For complete details contact your nearest agent for information or estimate.

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- No Internal Packing
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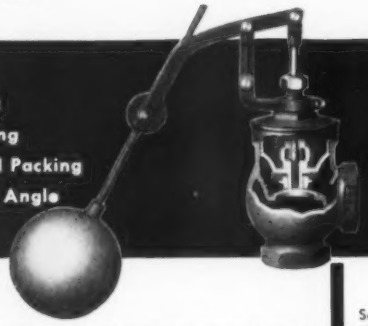

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- Sizes ½" to 12"
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The complete line of Davis Float Valves offers a wide variety of units for almost any given service. These valves are simple in construction, rugged in service, and accurate in operation. You get efficient control with low over-all expense. Davis float valves require less maintenance, preventing costly shutdowns. Let us give you complete service recommendations. Write today!

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—Combines the best features of both lockers and coat racks.

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Lockerettes save space too . . . the No. 6-12 (2-column) accommodates 12 people in 6 ft; the No. 9-18 (illustrated) accommodates 18 in 9 feet.

Write for Bulletin No. OL-14

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DATA FILE

(Begins on page 187)

zontal shaft, single-stage, rear-entrance automatic priming pump; vertical shaft pumps with standard, overhead and quill bearings for wet pit use. Nagle Pumps.

325 **"A Turn for the Better"**—Bulletin 30-B, 8 pp, discusses manufacturer's improved Moyno pump, explaining in detail its progressing cavity feature and showing how the rotary motion created provides continuous flow at positive pressure. Stresses performance advantages of the pump. Pump Div., Robbins & Myers, Inc.

326 **Condensed Pump Data**—Form 4383-J covers more than 20 types of general service pumps, rotary pumps, sump and drainage pumps, condensate units, self-priming units, stainless steel pumps and high pressure pumps. In easy-to-find tabular form, each model is pictured along with its characteristics, applications, and features. Goulds Pumps, Inc.

327 **Data on Pumps**—This 12-pp condensed catalog covers turbine-type and centrifugal pumps for a wide range of industrial uses. Gives construction specifications, capacities, application information as well as reference to specific literature on each type. Fully illustrated. Also includes data on mixed flow pumps, sump pumps. Aurora Pump Co.

328 **Cradle-Mounted Pumps**—Sixteen-pp Form 7223, covering general purpose centrifugal pumps of the cradle-mounted type, presents five basic groups and 17 corresponding pump types, their capacities, horsepower ratings and uses. Includes dimensions and a table of performance under 60 cycle use. Ingersoll-Rand Co.

329 **Multi-Stage Compressors**—Featured in 36-pp Bulletin 116 is a presentation of engineering data and performance characteristics to enable plant engineers to approximate power requirements, rotative speed and discharge temperature for most multi-stage centifugal compressor applications. Clark Bros. Co., Inc.

330 **Improved Compressor**—How this manufacturer's Spiraxial compressor for air or gas is designed to provide peak efficiencies with minimum servicing is explained in Bulletin SC-152. Construction and design details are discussed in detail. Roots-Connersville Blower.

331 **Centrifugal Compressors**—Twelve-pp Bulletin 109 describes and pictures single-stage centrifugal compressors for delivering large capacities of pulsation-free air or gases. Their functions, applications, ratings, construction features, arrangements and methods of control are presented. American Blower Corp.

Postage-free Reader Service Cards make it easy to order any of this literature. See pages 35-36 and 185-186.

332 **Air Compressor Selection Data**—Factors to be considered in selecting a compressor are discussed and selector charts provided in 20-pp Bulletin IDC 9302-3, covering manufacturer's Y and G air compressors. The Y line includes tank mounted and bedplate units, single- and two-stage types. Special features of each model are described, dimensions and ratings given. Westinghouse Air Brake Co.

333 **Compressors, Pumps**—Catalog 546, 6 pp, presents company's line of air and gas compressors, Oilfreair and Oilfregas compressors, dry vacuum pumps, aftercoolers, Airchek valves, and centrifugal pumps for boiler feeding and general applications. Includes brief descriptive data. Pennsylvania Pump and Compressor Co.

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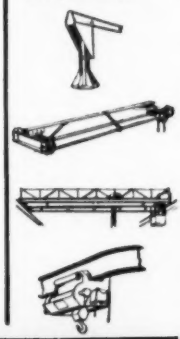
The Abell-Howe line includes a wide range of motorized and hand operated cranes, runways, monorails, electric hoists, storage racks and accessories.



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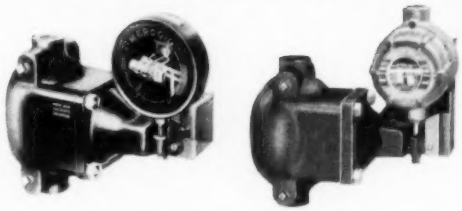

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Construction: Float chamber available cast iron, steel or stainless steel. Float—steel, nickel plated, copper, or stainless steel. Packing Gland—brass, monel or stainless steel. Also available packless (torque rod) construction.
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*With special construction Mercoid Liquid Level Controls are available for specific gravities as low as 0.45

(Write for Bulletin 39S.)

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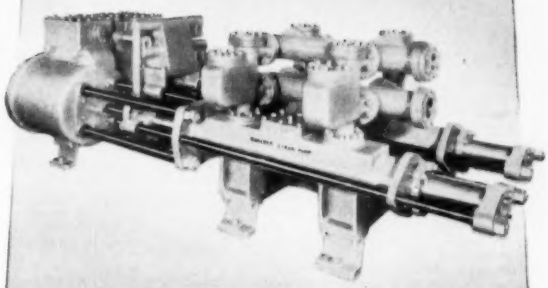
"PALMETTO® 1000" rides the rods—without hardening



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PALMETTO 1000 is built up from high grade 12 cut white asbestos yarn—each strand saturated separately with a special lubricant before being twisted and braided into the finished packing. This thorough lubricating technique means maximum pliability under extreme temperature conditions — frictionless operation — score-free rods and shafts—long, uninterrupted service.

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DATA FILE

(Begins on page 187)

PACKINGS, GASKETS

334 Buyer's Guide on Packings—Twenty-pp Catalog PC-101 brings together all material on company's Palmetto packings and includes data on packing for liquid pistons on inside-packed piston pumps. Greene, Tweed & Co.

335 Packings and Gaskets—In this 40-pp belting and packing manual (NY-2697-P) are helpful charts plus information on the care, use and maintenance of rod and sheet packings and gaskets. A complete engineering section contains all necessary charts and tables for determining working specifications of packings. Also included are packing recommendation charts. New York Belting and Packing Co.

336 Industrial Gaskets—This highly informative 50-pp catalog covers an extensive line of gaskets and teflon products, including practically all types of metal, metal-asbestos and special gaskets as well as teflon stock. Includes both engineering and ordering data, application and installation tips. United States Gasket Co.

337 Long Wearing Piston Packing—Form 4502, 8 pp, presents composition cups for packing pistons of air and hydraulic cylinders and reciprocating pumps. Engineering information covers properties, textures, temperature and pressure data, sizes. Darling Valve & Mfg. Co.

338 Braided Rod Packing — This 8-pp bulletin outlines advantages of company's lattice-braid rod packing. Contains sectional drawings, showing their unique structure, illustrations of types available, tables of service recommendations, specifications. The Garlock Packing Co.

VENTILATING AND AIR CONDITIONING

339 How Conditioning Units Can Help—The advantages of self-contained units in cooling, dehumidifying, cleaning are cited in 40-pp Catalog 1307. Explains installation, operation. Provides data on direct expansion and cold water cooling, hot water, steam heating. Clarage Fan Co.

340 Vaneaxial Fans—Bulletin J-611 is a 16-pp booklet presenting company's Axivane Series 1000 fans. Explains advantages afforded by adjustable blades for ventilating and other industrial applications. Fans in this line consist of 136 models from 18 to 84 in. dia., volumes to 150,000 cfm. Photos of typical installations included. Joy Mfg. Co.

341 Putting Air to Work—Catalog 600 is an excellent, 60-pp reference text on air and products to put it to work. For plant engineers concerned with heating and ventilating of plant areas; air conditioning installations; means of exhausting fumes, gases and dusts; conveying chips and granular materials; elimination of airborne dirt—this book is a valuable tool. It's packed with information on selecting and applying equipment, and there is a section of frequently-used reference data. Sturtevant Div., Westinghouse Electric Corp.

342 Air Conditioning Book, Heating—Bulletin PB-290, 36 pp, is a complete, condensed catalog covering company's full line of air conditioning, heating, ventilating and heat transfer equipment. Supplements some 40 specialized bulletins on various product lines. The Trane Co.

343 Roof Ventilators, Louvers—Now available to qualified plant engineers is a collection of literature on gravity and powered proof ventilators and ventilating louvers. Includes a résumé of engineering helps for working out a ventilating problem—a guide for estimating ventilating requirements, installation procedures, sizes and capacities. The Swartwout Co.

344 Push-Button Ventilation — Six-pp Bulletin 680 gives sizes, dimensions and performance data on power roof ventilators for flat, curved or peak roof installations, capacities to 78,800 cfm. Cites advantages of ventilation by positive air displacement. Propellair Div., Robbins & Myers, Inc.

345 Air Conditioning Cabinets — Engineering Bulletin 3703A, 40 pp, describes and illustrates manufacturer's Model G cabinets, central units available in both horizontal and vertical models, providing 875 to 22,000 cfm and offering combinations for any function or functions of air conditioning. Booklet gives construction details, discusses heating and cooling coils. Buffalo Forge Co.

346 Improved Air Conditioning—Advantages and applications of a controlled humidity method of air conditioning are discussed in Bulletin 112. Process is explained, illustrated. Niagara Blower Co.

BOILERS, GENERATORS

347 Oil or Gas Fired Automatic Boilers—Boiler, burner, controls and safety features of 10 to 500 hp oil or gas fired automatic boilers are described in this 4-pp bulletin. Firing rates, dimensions and capacities are given for all models. Boiler Engineering & Supply Co., Inc.

348 Steam Generators—Data and specifications for completely plant assembled water-tube steam generators are contained in this 8-pp bulletin. They cover nine

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WANTED FOR PERU—Engineer for supervising plant manufacturing, galvanizing and pickling of tubing. Must be capable installing galvanizing plant. State references. Address Box 2018, Plant Engineering, 110 S. Dearborn St., Chicago, Illinois.

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• ARMSTRONG HUMIDIFIERS introduce clean dry steam directly into the atmosphere—automatically increase humidity to keep it within 1% or 2% of the desired level. They are easily connected to existing steam and electrical or air systems, cost from a few pennies to perhaps $1.00 per day to operate depending on size of unit. A unit capable of supplying 60 lbs. of moisture per hour lists at only $182.25 complete with control.

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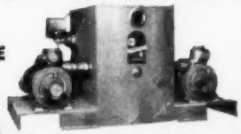
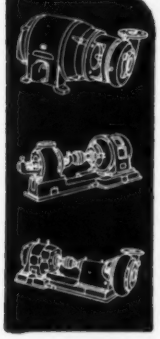
APCO *Packaged* CONDENSATION RETURN UNITS

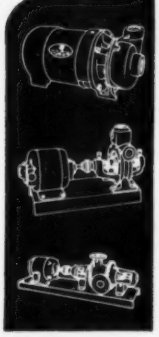
for the SMALL LOW PRESSURE JOBS

10 to 40 lbs. with 8, 15, 30 Gallon Receivers



Packaged Duplex Condensation Return Unit with No. 4 Series Apco Pumps.





Start saving valuable heat units with APCO Square Tank Units. Built to meet demand for a smaller unit with the superb performance of our larger units. Remember, the Pumps are Apcos. No Vapor Binding — Special Provision for Expansion and Contraction — No Frictional Wear within pump. Thus, ECONOMY.

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Flexible Cord

DYNAPRENE is better because it lasts longer. It is made of an exceptionally tough neoprene compound developed after extensive research and experience. It is made by the continuous vulcanizing process that guarantees accurate centering and even cure, eliminating thin, weak spots. DYNAPRENE is a truly modern cord made to withstand the rigors of constant use yet is priced only slightly higher than other types of cord that need frequent replacement.

Be sure to specify Whitney Blake SO, SJO or SV-type neoprene jacket for your flexible cord requirements.

WHITNEY BLAKE CO.

WELL BUILT WIRES SINCE 1899

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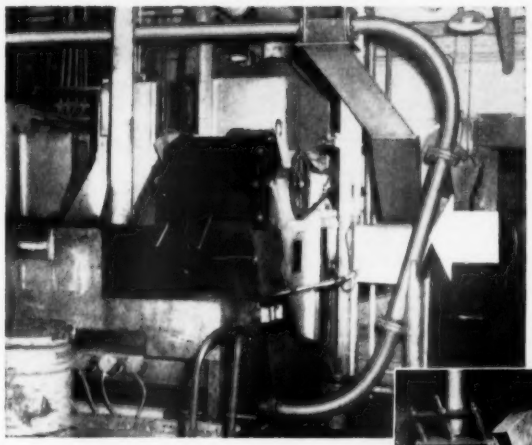
SEE HOW YOU CAN HANDLE "HOT JOBS" WITH *Hapman* TUBULAR CONVEYORS

and save money too!



Chip-handling conveyor will remove chips from coolant.

THREE MAN-DAYS AND EIGHT HOURS of valuable production time every month were formerly lost in removing scale from the quench tank at Bower Roller Bearing Co., Detroit. An unpleasant job, too!

NOW . . . A HAPMAN TUBULAR CONVEYOR removes the scale *as it collects* . . . takes *no* labor or production time . . . gives *big savings!*

HAPMAN'S UNIQUE, *patented* "Sealed-Pin Chain" construction is highly resistant to abrasive and corrosive action . . . gives greater chain life . . . cuts operating costs. Solid, *tubular* design is liquid-tight.

LET HAPMAN TUBULAR CONVEYORS handle *your* "hot jobs" . . . save *you* money . . . boost *your* efficiency. Get all the details.

WRITE TODAY FOR BULLETIN PE-1053

Cross section showing Sealed-Pin Chain and Neoprene Flights.

Hapman CONVEYORS, INC.

DIVISION HAPMAN DUTTON COMPANY

KALAMAZOO MICHIGAN

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DATA FILE

(Begins on page 187)

sizes from 5,300 to 33,000 lb of steam per hour and for pressures up to 400 psi. These units are designed for fully automatic firing with oil, gas, or stoker-fired coal. Superior Combustion Industries, Inc.

349 How Much for Steam—This is a "slide rule" calculator for computing steam costs. It's pocket-sized, and enables a plant engineer to find comparative steam costs per 1000 lb, using coal, oil or gas, and based on fuel costs of price per ton, gallon, cubic foot. Cleaver-Brooks Co.

350 Shop-Assembled Boiler — Sixteen-pp Bulletin G-76, completely describes and illustrates company's Type FM water-tube integral-furnace boiler, made in standard sizes from 2900 to 28,000 lb of steam per hr, pressure to 250 psi. Capacities, dimensions given. The Babcock & Wilcox Co.

351 Steam Generators — Illustrated Bulletin SB43, 20 pp, describes company's VL factory assembled generators combining 2-drum water-tube boiler, integral water cooled furnace, brick work, insulation and steel casing. A large cutaway illustration shows design details, and gas travel, circulation and furnace interior are also pictured. Use of the generator with various fuels and firing arrangements is covered, dimensions included. Erie City Iron Works.

352 Packaged Boilers—This 16-pp illustrated catalog describes manufacturer's new Type VP package boiler. Following a section of background information is an outline of principal design features of these boilers, which are shop assembled and provide steam capacities from 4000 to 30,000 lb per hour. Space requirements are shown in a table along with typical specifications. Combustion Engineering, Inc.

HEATING, COOLING

353 Faster Tank Heating, Cooling—Bulletin IP-250, 8 pp, describes company's Platecoils, embossed metal sheets welded to form compact units through which required heating, or cooling, medium is circulated under pressure. Explains lower costs, faster tank cooling or heating, lighter weight of the units. Kold-Hold Mfg. Co.

354 What Unit Heaters Can Do—Featuring many photos showing how unit heaters are being used to provide heating comfort, cut fuel costs, provide economical air circulation, 8-pp Bulletin 149-A discusses advantages of these heaters and includes performance data. Modine Mfg. Co.

"I said to refill it with ticker tape, not sticker tape!"

355 Heat-on-Wheels for Industry—Illustrated Form 3574, 16 pp, is the story of how manufacturer's portable heaters can solve emergency heating problems. Shows how these heaters provide extra heat for the hard-to-heat spots, and for extra cold areas, to spot heat where needed, and for ventilating, drying, thawing. Herman Nelson Div., American Air Filter Co., Inc.

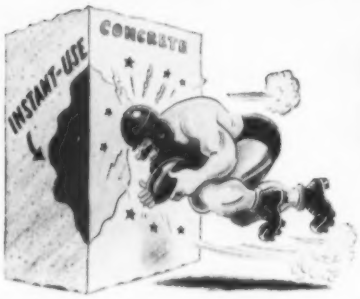
356 Engineering Data for Heating Systems—A great deal of helpful information on heating systems is presented in Engineering Data Manual 2695, 28 pp. Detailed, illustrated information pertaining to heating problems is given. Besides covering heating terminology, there are sections on steam data, water properties, piping data, weights and measures and pipe dimensions. C. A. Dunham Co.

357 Electric Heaters—Bulletin E-1, 8 pp, describes electric unit heaters and heater sections for general industrial heating as well as for specialized use in heating corners of factories, warehouses. Illustrates overhead downward discharge heaters with revolving and stationary discharge outlets and a heater with horizontal discharge. An electric duct heater section is also described. L. J. Wing Mfg. Co.

358 Heat Transfer Equipment—An excellent source of information on shell and tube heat transfer equipment, 28-pp Catalog DM-1150 covers heat exchangers, tank suction heaters, oil preheaters, condensers, evaporators, after-coolers, gas coolers, centrifugal pumps and water heaters. Instructions for installation, operation and maintenance are included. Bell & Gossett Co.

359 Industrial Dry Coolers — Illustrated Bulletin DC-50, 12 pp, presents dry cooling equipment for small, "in-between," and heavy-duty cooling jobs and includes three recent models. Two are small "portable" units and the third a medium size unit. Although designed primarily for cooling engine jacket water, they can be used for cooling natural gas, lube oils, fluids of refining stages. The Marley Co., Inc.

REPAIR CONCRETE WITH INSTANT SETTING PATCH



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Please send me complete INSTANT-USE information, details of TRIAL ORDER PLAN and HAND BOOK OF BUILDING MAINTENANCE—no obligation. (Clip and attach Coupon to Co. letterhead.)

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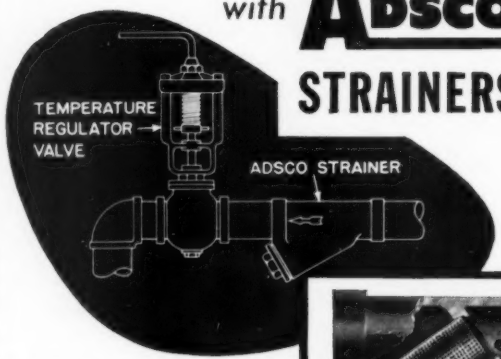
PROTECT Valuable Equipment with ADSCO STRAINERS



● Uniform, snug fit of screen in ADSCO Y-type Strainers is guaranteed by gasketed cap and tapered seats. When furnished with semi-steel body and perforated brass-sheet screen, these strainers are of 250 lb. design. Screen ratios as high as 8-to-1. Bodies and screens of other metals furnished for higher pressures and temperatures. Write for Bulletin 46-50B.

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NORTH TONAWANDA, NEW YORK
Since 1877

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BECKER "53"

CO_2 POWERED INDUSTRIAL

SPRAY GUN

- ✓ Nozzle removes without pressure loss
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- ✓ Air hose attachment (optional at extra cost)

ONLY $19.95 with 10 cartridges

New Becker Model "53" Spray Gun, specially engineered for industry, sprays protective coatings, paints, solvents, cleaners, oils, etc. *Completely portable!* Powerful CO_2 cartridge (10 for $1.00) sprays up to one 21-ounce containerful. Tank can be charged from air hose (for liquids atomizing at 120 psi), with special attachment. Rugged steel tank, machined brass and stainless inserts, cast aluminum head. See your Distributor or order direct postpaid.

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   No maintenance because they are self-lubricating.
2. **NEVER RUST NOR STICK**
   Nothing to rust—not affected by dust.
3. **EVEN WET CONDITIONS**
   Ideal for "wet packaging" such as bottling plants, damp atmosphere, etc.
4. **"OUT OF SIGHT—OUT OF MIND"**
   Years of service without care.
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   Replace other types of bearings with Arguto in a couple of minutes without special tools.
6. **LOW IN COST**
   The most economical bearings on the market.
7. **IN STOCK**
   Prompt delivery on standard conveyor roll bearings.

Arguto Catalog #210 is your reference book to eliminate conveyor roll trouble—also contains complete information on Arguto Screw Conveyor Bearings and Engineering Data.

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20 years without a drink

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DATA FILE

(Begins on page 187)

360 Forced Air Space Heaters — Illustrated Bulletin 523-B, 12 pp, is devoted to a line of forced air heaters for comfort heating, year-round ventilating, tempering make-up air, process drying and heat curing. Explains design efficiency, construction details, operating principle and flexibility of application. Advantages of the heaters are detailed. These heaters are direct fired by oil, gas or combination fuels. Dravo Corp.

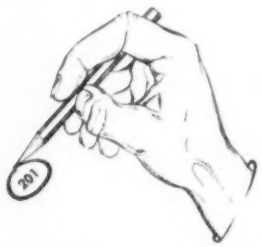
361 Heat Exchangers, Storage Heaters—Sixteen-pp Catalog 5 covers more than a dozen types of hot water storage heaters and heat exchangers, including horizontal and vertical hot water storage heaters, instantaneous water heaters, convertors, condensate coolers. Tables assist in selecting correct equipment for given operating conditions. Patterson-Kelley Co., Inc.

WIRE ROPE, SLINGS

362 Wire Rope, How to Use It—Practical information on the use and care of wire rope is given in 72-pp pocket-size Catalog C-51. Covers unloading, storing, kinking, unreeling, installing, breaking in, methods of seizing and cutting, measuring, end preparations, many other pertinent factors. Fully illustrated with photos and sketches, treats splicing in detail and includes chapter on lubrication. Also presents data on wire rope constructions, efficiencies of fittings. Available to qualified plant engineers. A. Leschen & Sons Rope Co.

363 Slings for Industry—Form 5308 is a compact reference bulletin packed full of sling data. Lists slings of approximate breaking strengths of 1000 lb to 243.4 tons, along with their safe loads for various angles of use. Macwhyte Co.

364 Sling Handbook and Riggers Manual—In the sling handbook section of this 48-pp book, 11 sling types are illustrated and their dimensions, weights and safe working loads given. Illustrations of sling uses accompany factual data. Also pictured and detailed are sling fittings. Information on care of slings, data on braided wire fabric, and directions on splicing braided wire sling fabric are included. The riggers manual gives detailed instruction on splicing, and includes data on efficiencies of wire rope attachments and directions for attaching sockets or ferrules. Shows signals for operating overhead cranes. Union Wire Rope Co.



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LIGHTING, COMMUNICATION

365 How to Use Sound Signals—This new 44-pp combination manual, data book and catalog is an excellent reference work on industrial sound signals. Includes a simplified explanation of fundamentals of sound; a glossary of sound and signal terminology; a quick-comparison guide for selecting equipment; suggested steps in choosing a signal installation, and hints for compiling a coding signal call system. Benjamin Electric Mfg. Co.

366 Lighting Fixtures—Full information on company's fluorescent lighting fixtures designed for efficient industrial lighting and reduced maintenance is provided in Form OD-568. Day-Brite Lighting Inc.

367 Lighting Fixtures—New Section K of Condulet Catalog 3000 describes components, performance data, and methods of relamping for any of the manufacturer's new EV series explosion-proof and weather resistant lighting fixtures. It contains illustrations showing steps for easiest relamping and installation of this type of fixture. Crouse-Hinds Co.

368 Selection Data on Lighting Fixture Hangers—Catalog 50, 80 pp, contains general and detailed information on disconnecting and lowering lighting fixture hangers, accessories, special devices and parts. Utilizes 247 photos and drawings to show construction principles, operating features, installations, modifications and component parts for both indoor and outdoor units. The Thompson Electric Co.

369 Group Lamp Replacement—This 10-pp booklet, "Group Lamp Replacement Pays Off," is a case history report on group replacement plans. Recommends two methods, one based on replacement when lamps have burned a fixed percentage of their rated life; and the other, on replacement when lighting drops to an established minimum level. Lower labor costs, lower accident rates, higher lighting levels, and other beneficial results are discussed. Lamp Div., General Electric Co.

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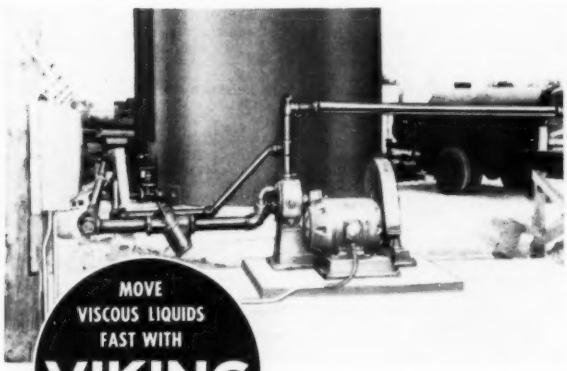

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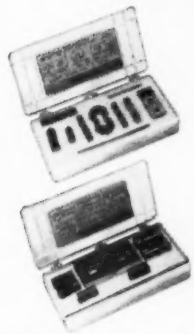

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Shop Supt. says magnets "... *prove very successful for holding parts during stroke of press*" in piercing die operation.

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THESE are but 3 of hundreds of comments from shop men who have obtained "You-Try-It" Shop Packages of Carboloy permanent magnets.

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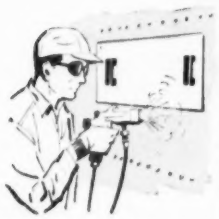
Order Carboloy magnet "You-Try-It" Shop Packages yourself. Perhaps they will spark you, too, to savings in your plant. See coupon.

Hold small parts for light grinding.

Identify grade of stainless steel.



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You'll see other savings, too—how 13 Westinghouse manufacturing plants give local engineering and construction service, prompt delivery to meet close schedules—how Westinghouse Panelboard quality gives unfailing performance and greater protection.

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DATA FILE

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OTHER EQUIPMENT

370 Plumbing, Heating Supplies—Edition G is the current edition of this company's 118-pp general catalog on plumbing and heating repa." parts, tools and accessories. Indexed and generously illustrated, g.ves sizes, intended uses and necessary ordering information. J A. Sexauer Mfg. Co., Inc.

371 Engineered Vibration Control—Bulletin 104 presents spring, cork and rubber mountings, discussing advantages of each and use alone or 'n combination. Provides helpful selection chart showing recommended and alternate methods of isolation. The Korfund Co.

372 For Conductometric Determination of Solids—A quick and simple method for determining solids contents of boiler water or condensate is explained and illustrated in Bulletin TRE50. Hall Laboratories, Inc.

373 Production Control System, Procedures—Publication X-1268, 56 pp, details a method of material control intended to result in a shorter planning cycle while speeding production by eliminating causes of delay on the production line. Illustrated with typical forms and charts, book outlines procedures fo. engineering, production planning and progress, machine load, material and tool procurement and control. Remington Rand Inc.

374 Neoprene Design Book—This illustrated bulletin discusses the properties of Neoprene, showing how they are utilized in products made from this chemical rubber. Covers its toughness, hardness range, air retention, performance under load, at extreme temperatures, flame and chemical resistance. Rubber Chemicals Div., E. I. du Pont de Nemours & Co.

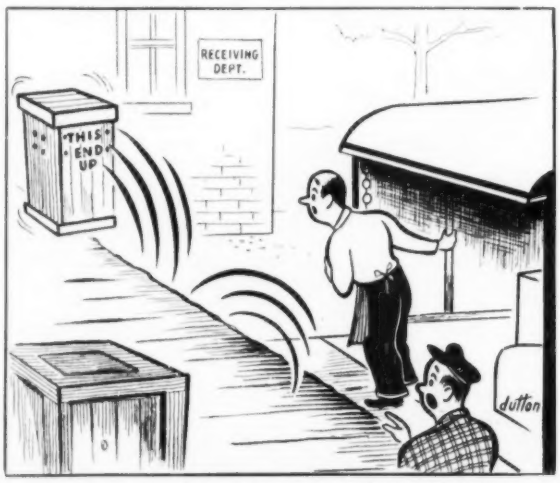
375 Good Place for Wraps—Manufacturer's Lockerettes, modern scientific locker units combining best features of both lockers and coat racks are described and pictured in Bulletin 658. Vogel-Peterson Co.

376 Finishing Systems—Illustrated Catalog A-653, 12 pp, describes complete finishing systems for porcelain and synthetic enamel, lacquer, paint, and other finishing. Also covers a variety of other industrial equipment including ovens, dust collectors and fog filters, metal cleaning and pickling equipment. The R. C. Mahon Co.

377 Socket Head Fasteners—Advantages of company's screw products are described in this folder. Included are socket head cap screws, shoulder screws, flat head socket cap screws and button head socket screws. Also described are socket screw keys, square head set screws, pressure plug and dowel pin. Standard Pressed Steel Co.

378 Hints on Babbitting Practice—In outlining basic steps for the prevention of common bearing failures, Bulletin 146, a little 16-pp booklet, covers everything from the choice of metal for a particular bearing application through the correct pouring practice to in-service maintenance. Proper lubrication, a maintenance schedule, and operation at correct speed are discussed. Federated Metals Div., American Smelting and Refining Co.

379 Industrial Leathers—These illustrated data sheets cover company's leather products and include specifications on various types of leather belting. Also give data on leather packings for hydraulic and pneumatic equipment. J. E. Rhoads & Sons.



"There goes that crate from Australia again!"

DATA FILE

(Begins on page 187)

380 **Standardized Spray Booths**—Literature is available on water wash, dry type, bench or leg type spray booths, based on standard panel sizes. Stresses easy erection, lower costs. The DeVilbiss Co.

381 **Flexible Hose, Bellows**—Catalog CMH-123, NPH, 16 pp, describes and gives specifications for manufacturer's line of Flexon bellows and flexible metal hose. Information on metallic bellows of stainless steel, brass, bronze and other alloys is included, covering bellows used in many types of control, regulators and thermostatic devices. A selection guide is provided. Flexonics Corp.

382 **Steam Condensers**—Bulletin 102, 24 pp, is a comprehensive presentation of manufacturer's steam condensers and includes photos of six typical installations as well as a section of engineering data, a discussion of air removal equipment and condenser maintenance. Condenser Service & Engineering Co., Inc.

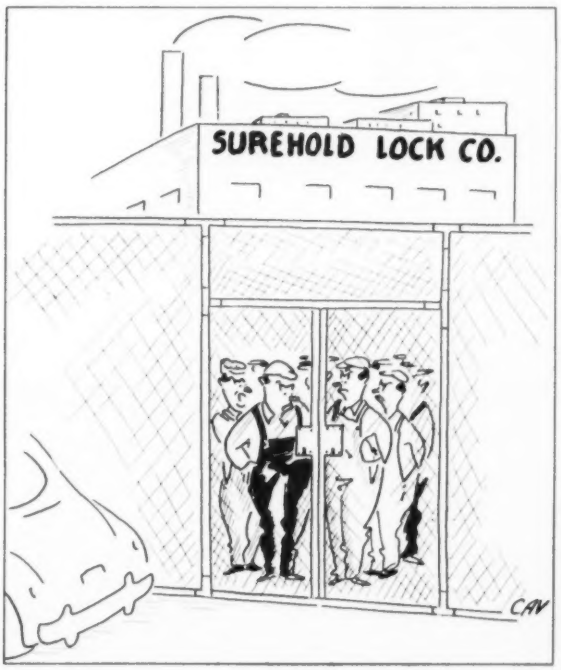
383 **Air Line Cleaner**—Eight-pp Catalog 252 describes manufacturer's Aridifier, a mechanical device for removing moisture, scale and other impurities from air or gas lines. Explains, illustrates operation, shows some typical applications and gives average cfm requirements. Tells how to select proper size unit, where and how to install it. Logan Engineering Co.

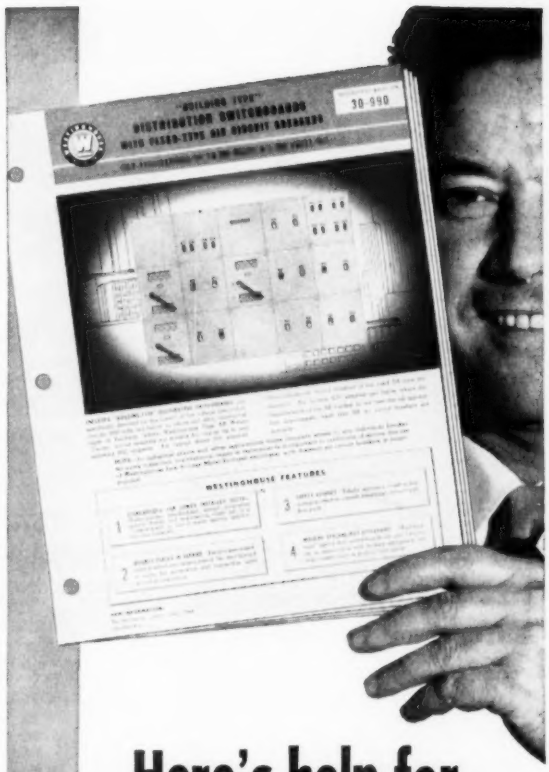
384 **Hose and Tubing**—Catalog CC-400 is a 16-pp illustrated quick-reference booklet on manufacturer's flexible metal hose and tubing. These products are made in two basic types: seamless and strip wound. Catalog shows wide range of available alloys and sizes, suggested uses; gives engineering data. The American Brass Co.

385 **Hydro-Pneumatic Accumulators**—Bulletin 301, 12 pp, explains the function, construction and operation of company's hydro-penumatic accumulators, giving size and pressure data. Tells how to choose an accumulator with Boyle's law. Use of accumulators as an auxiliary source of power for intermittent duty systems, for leaking compensation, for operating secondary circuits, as an emergency source of power are discussed. Greer Hydraulics, Inc.

386 **Handbook on Fluid Circuits**—Now available to plant engineers is the second printing of "The Circuit Rider." This 32-pp pocket-size manual presents a down-to-earth discussion, together with drawings, of basic designs in fluid power circuits and points out the wide range of operations possible through the application of different types of such circuits. The Logansport Machine Co., Inc.

387 **Industrial Exhaust Fan**—Housing design, wheel construction and standard arrangements of manufacturer's Type EX exhausters are discussed in illustrated Bulletin C-46EX. Provides capacity tables, dimensions and photos of standard and special fan. Bayley Blower Co.





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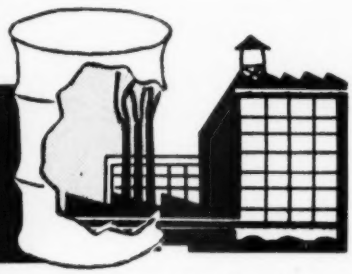

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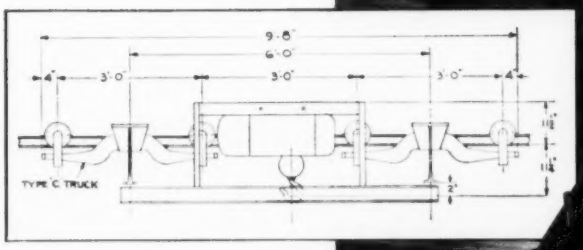

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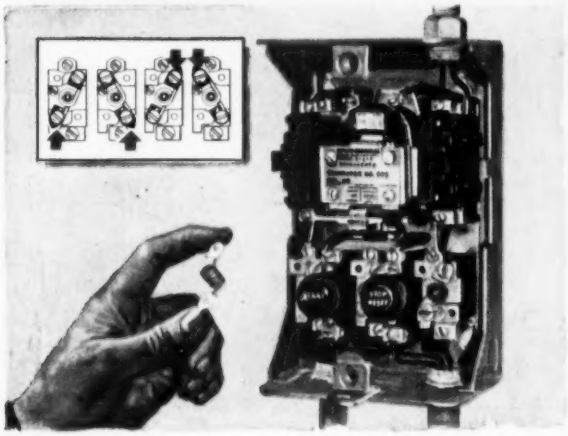

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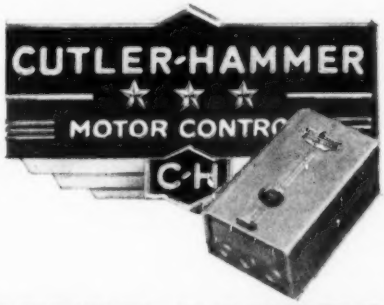

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